

AMERICAN RAILROAD JOURNAL, AND ADVOCATE OF INTERNAL IMPROVEMENTS.

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} PROPRIETORS.

SATURDAY, OCTOBER 1, 1836.

[VOLUME V.—No. 39.

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AMERICAN RAILROAD JOURNAL.

NEW-YORK, OCTOBER 1, 1836.

NOTICE TO CONTRACTORS.

HARTFORD AND NEW-HAVEN RAILROAD.

For the purpose, alone, of a more widely extended notice, the letting of the Northern Division of the HARTFORD AND NEW-HAVEN RAILROAD, will be deferred until the 15th of October next. Up to that day, inclusive, proposals will be received at the Engineer's Office (corner of East and Collis sts. New-Haven,) for the excavation, embankment, masonry and carpentry, necessary to prepare the road for the reception of the superstructure.

Maps, profiles, plans, and specifications, may be examined at the Engineer's office; and printed forms may be obtained by application at the same place, giving a general view of the nature and amount of the work of different kinds which is to be done.

ALEXANDER C. TWINING,

Engineer.

New-Haven, Sept. 20, 1836.

TO CONTRACTORS.

TWO hundred thousand yards of earth will be removed by contract on Staten Island. Persons desirous of making contracts will make immediate application. The work will be divided in 1000 feet sections, and let in part or main.

Apply at the office at Fort Tompkins, Staten Island, where the profiles can be seen and the ground examined.

W. JAY HASKETT,
Chief Engineer.

For the Railroad Journal.

COVINGTON, TIOPA Co., PA., }
August 15th, 1836. }

TO THE PRESIDENT AND MANAGERS OF THE TIOPA NAVIGATION COMPANY.

GENTLEMEN—The Engineer Department of the Tioga Railroad was organized and surveys commenced about the 1st of November, 1835. The examinations preparatory to the final location were completed during the past winter, and a definite location would have been made also, for a considerable portion of the road, had it not been

for the uncommon severity of the winter.—

The 28th of March was the earliest day on which the final location could be commenced, since which time the entire length of the road has been prepared to let, and from the 28th of April to the present time, and at different periods 19 ¹⁷/₁₀₀ miles of the most expensive part of the road has been put under contract and the work commenced with considerable energy, considering the difficulty of procuring laborers in this section of country. The time given for the graduation to be completed, expires on the 1st of December next, with the exception of two or three heavy sections, on which this time was extended.

There is so much uncertainty in procuring laborers, at present, that it is impossible to say with any degree of assurance that the contracts will be complied with, by the time specified; but as the work is let to responsible men, we have good reason to believe that they will use every exertion to comply with their engagements.

In December last, proposals were received and contracts made for the delivery of all the timbers necessary, for the entire length of the road. These contracts have been partially fulfilled, and the contractors are still proceeding to comply with their engagements which the severity of the winter prevented them from having in as forward a condition as they expected.

The rail timbers are to be of sawed white oak or Norway Pine, 6 x 7 inches clear of sap, except 1 inch on the corners. The ground sills are required to be 6 x 12 inches, hewed level on two opposite sides, and furnished of white oak, pine, or hemlock at the option of the furnishers.

The cross-ties are to be furnished of white oak and chestnut exclusively, 8 inches in diameter at the small end, and 8 feet long.—There will be nearly one half of the cross-

trees sawed 6 x 6 inches and 8 feet long.—

The cross-ties will be placed 3 feet 9 inches apart from centre to centre.

All the timber under contract is required to be delivered on the line of the road, piled at stations half a mile apart, each station having a sufficient quantity at it, to construct half a mile of the road, viz:—One fourth of a mile, each way from the station. The contractor who lays the rails has in this way, only to transport his timber ¹/₄ of a mile, the greatest distance.

The method which was recommended, and now pursued in letting the graduation and masonry is strictly that which has been adopted by the Baltimore and Ohio Railroad Company, for some years past, and as it is that plan which has resulted from years experience, I hope you will receive the full benefit of it. Before the day of letting, descriptions were given of each section, and the probable quantity of excavation and embankment each section contained, as ascertained from the centre cutting, and the form of the contracts were exhibited and all such other information as would assist bidders in forming a correct idea of the work to be done, and the manner of its execution.

From the preliminary survey, which was made on both sides of the Tioga river below Berry's bridge, an approximate estimate was made out by me, comparing the probable expense on either side. This estimate was submitted to Benjamin Wright, Esq., the consulting Engineer, on which he reported to you his views of the subject,—a copy of this report is herewith annexed.—As the subject has undergone your consideration, and resulted in directing me to confine the location of the road to the east side of the river to the State line. It is unnecessary to say more than, that your direction has been complied with.

I will now lay before you the estimated

Cost of the graduation, masonry, and superstructure of the whole road.

ESTIMATED COST OF GRADUATION AND MASONRY.

1st Division,	Graduation of road bed,	\$498.64 23
12 ² / ₁₀ miles,	Masonry,	5544 00
2nd Division,	Graduation of road bed,	471.29 05
13 ² / ₁₀ miles,	Masonry,	5906 50
		\$108443 83

Making an average per mile of \$4188 64 for the graduation and masonry.

The superstructure of the road is estimated to cost as follows, per mile, viz:

11,038 ft. Lineal Measure of rails or string pieces at 3 ⁶ / ₁₀ cents per foot lineal,	\$403 04
11,038 ft. lineal measure of ground sits at an averaged price of 3 ¹ / ₂ cts. per foot,	360 36
1,430 cross-ties at average price of 20 cts.,	296 00
22 ² / ₁₀ tons of iron 2 ¹ / ₂ inches broad and ³ / ₄ inches thick at 80.00 dolls. per ton, delivered on the road,	1789 60
1000 lbs. of 4 ¹ / ₂ inch spikes at 10 cts. per lb.,	100 00
Small nails for plates.	4 00
760 plates for joining of rails at \$35.00 per thousand,	26 60
Laying rails per mile including transportation of timber and iron, also dressing off the road bed and opening drains,	960 00
Road crossings,	20 00

Cost per mile, \$3964 60

RECAPITULATION.

Graduation and masonry for whole distance,	108,443 83
27 miles of superstructure at \$3964 60 cts. per mile,	107,044 20
This extra distance is allowed for second track at the Turnouts.	
5 turnouts and fixtures at \$140 each,	700 00
Contingencies ten per cent.,	21,618 00

Total cost of constructing road, \$237,806 83

Making an average per mile of \$9,181 73

In addition to the above sum to be expended in the construction of the road, a further outlay may be expected in putting the road in operation, after its completion, which may be nearly estimated as follows:

2 locomotive engines with tenders at \$3500 each,	\$7000 00
50 transportation cars at \$140 each,	7000 00
5 passenger cars at \$450 each,	2250 00
Depots, water stations, car houses &c., say	3500 00
	\$19,750 00

With this addition to the cost of con-

structing the road, the capital to be expended before any of the advantages of the project can be realized will be \$257,556 83.

It is true that the business of the road might be commenced with a small reduction of the above expense, but if the anticipated success attend the work, the above sum may be regarded as outlay for the first year.

If the above estimate shows a greater expenditure necessary than was first expected by the friends of this work, they may attribute the cause mostly to two things, the first to the rise of labor of every kind, on public works, and secondly, to the price of iron which has risen nearly 100 per cent. within the last six months.

My estimate of the value of the work, I think very liberal and more particularly so, as it was designed to push the graduation and masonry to completion by the coming fall.

I will here remark that the estimate for the graduation and masonry above is taken from that furnished you previous to the letting of the work, in which the road was divided into sections, and each section estimated separately. The work already let is a fraction under the estimate.

GRADES, CURVATURES AND DISTANCES.

The distance from Blossburg, where this road commences to its termination at the State line, near Lawrenceville, is 25 ²/₁₀ miles. The total descent in that distance is 355.56 feet, reckoning from the grade of the road at its commencement to the termination of the same at the State line.

From Blossburg to Covington, a distance of 5 miles, there is a descent of 149.43 feet, making considerably more than ¹/₂ part of the total descent in ¹/₂ of the distance.

The maximum inclination of the grade line is 39.07 feet per mile and this extends only 3737 feet, and occurs 1 ¹/₂ miles below Blossburg.

The average grade from Blossburg to Covington, is 29.88 feet per mile. The grade from Covington to the termination of the road, varies from 5 to 25 feet per mile, and averages 9.86 feet per mile.

The road being on an average descent of 13.73 feet per mile from its commencement to its termination, will favor the expense of transportation very much, and the grades not being so great as to interfere with a return load of say ¹/₂ part of that taken down are to be desired rather than to be regretted, considering the great object in view, being the transportation of coal.

The following table exhibits the different grades adopted on this road, together with the length of each:

Length of grade in feet.	Rate per mile.	Total descent.
3737	39.07	27.65
4400	36.96	28.45
2400	34.85	74.29
2900	33.79	92.85
3000	31.68	110.85
3900	30.62	133.47

2600	29.04	147.77
1000	27.46	152.97
1800	26.40	161.97
500	25.34	164.37
1400	23.23	170.53
1200	22.02	175.53
11400	21.12	221.13
3600	18.48	233.73
900	17.95	236.76
10045	15.84	236.93
700	15.31	268.96
1100	13.73	271.82
13100	13.20	204.57
15500	10.56	335.57
5662	7.92	344.06
11500	5.28	355.56
34413	Level	355.56

136.757 feet, or 25 ²/₁₀ miles.

The curvature on this road may be said to be gentle, there being no curve of a less radius than 666 feet, and but a short distance, comparatively, at this rate. The straight part of the road is to the curved part, as 7.10 nearly.

OF THE MOTIVE POWER.

As it is designed to use steam by Locomotive Engines, for the motive power on this road, I will take the result of experience in the application of this power, and apply it to the grades and curvatures of this road to show what may be done on it in the way of transportation.

1st. It has been ascertained that the grades are all descending from the coal mines, and that the average of them is 13.73 feet per mile.

2nd. That there is no curve of a less radius on the road, than 666 feet.

3d. It has been proved that a locomotive steam engine of 7 ¹/₂ tons weight, including water and fuel will draw 112.5 tons on a level road, at a speed of nearly 12 miles per hour. The traction exerted in this case is therefore 112.5 × 12 = 1350 lbs. This traction is the measure of the adhesion, exclusive of the engine and tender, of 12 tons weight.

It has been also shown, by recent experiment, that a locomotive engine of 8 ¹/₂ tons weight, will impel, on a level, a load of 211 tons gross, at the rate of 11 ¹/₂ miles per hour, thereby exerting a tractile power of 2322 lbs., besides the resistance of the engine and tender.

If we consider, in the application which I propose to make of the above results, that a mean between them is the fair measure of the power of the engine which will be used on this road, we shall arrive at the following useful effects which may be produced:—

It is known that the friction or resistance on a level straight road, is about ¹/₁₀ or per ton,

The resistance from curvature on this road is estimated at

Total resistance per ton on a level

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The force of gravity on an inclination of 13.73 per mile, is 5.83 lbs. per ton.

DESCENDING LOAD.

	Tons.
40 Cars weighing 14 Tons is	50
2½ Tons of coal in each Car	100
Engine and Tender	12.5
	162.5

The effect of gravity in descending the average grade line is 5.83 lbs. per ton, which taken from the total resistance by friction and curvature, there remains 6.87 lbs. per ton, as the amount of traction necessary to be exerted in propelling the train, at a speed of 13 miles per hour. The total amount of traction necessary for a load of 162.5 tons on the average inclination, is, therefore, 1116 37 lbs., and the mean of that exerted as herein stated is 1836 lbs. By this calculation there appears no difficulty in transporting 100 tons of coal at each load on an inclination of 13.73 ft per mile. Where the road is level, which occurs in a few places, there will be more power necessary, equal to $162.5 \times 12.7 = 2063$ lbs. to maintain the speed above named of 12 miles per hour, which may be reduced at pleasure, as a substitute for the necessary increase of power on light grades, or on level parts of the road.

RETURN LOAD.

The return load, at the same speed will be considerably reduced, if we are governed, in the calculation, by the maximum inclination of the grade line of 39.07 feet per mile. The force of gravity on this inclination is 16.53 lbs. per ton and the resistance from friction &c., is 12.70 making together 29.23 lbs. per ton, as the total resistance.—Then on returning with empty cars there would be a gross load of 62.5 tons against gravity, and friction equal to 29.23 lbs. making 1830 lbs. as the tractive power necessary to return at a speed of 12 miles per hour. So it is seen that the Engine will descend with a load of 100 tons easier than it can return with the empty cars on an inclination of 39.07 feet per mile, at the same velocity.

The speed being inversely as the increase of resistance, it will be easy to lessen the former when occasion shall require and by an application of this principle to the above results, it will be found that the engine will ascend an inclination of 39.07 feet per mile, at the rate of nearly 7 miles per hour, with a return load of 30 tons nearly one third of that taken down. The attainments of high velocities, we are aware is not desirable in the transportation of coal, but as this road will no doubt, become of general use, such velocities as we have named are of much importance.

As the above results are obtained from every day experience and when applied to this road fully answer the purposes for either transportation or travel, I will not pursue this subject any farther.

GENERAL REMARKS.

In the preceding estimate of the costs or

this road, it will be seen that no mention is made of the damages done to the proprietors of land, either for land or fencing. It is difficult to make even an approximate estimate of these damages, for they vary so widely. In consideration of this circumstance together with the fact that you will soon be in possession of the actual cost of these damages, I decline entering into any calculations respecting them. It is not likely from the disposition generally manifested, that these damages will materially swell this estimate, for full two thirds of the owners have liberally relinquished all claims for damages.

Among the subjects for examination there remains one which I did not propose to investigate, as it has been carefully examined and resulted in a full conviction that this road, when completed, will nett an ample revenue to warrant its construction. We will not enter into a minute investigation of this subject, but examine a few of its leading points.

Under the head of *Sources of Revenue*, there may be enumerated several items of much importance, among these, and the principle of which, is that which will result from the toll and transportation of coal. It is easy to show that this article alone will warrant the expenditure herein estimated, if the supply and demand shall be constant, of which we cannot entertain a doubt, when the quantity of coal is abundant, and the demand for it already very great. For a complete and full investigation of the amount of coal capable of being raised in the Blossburg Coal region, I would refer to the very able report, on this subject, made by R. C. Taylor, Esq., in 1833. Mr. Taylor says that the quantity of coal in the neighborhood of Blossburg, is commensurate with the extent of any demand that can be contemplated. This being the case, and the demand for the article daily increasing, it would not be saying much, to say that as soon as this road is completed, and the mines properly opened, 300 tons will be furnished daily for transportation, for 300 days per year. The charter allows 2 cents per ton per mile, as the maximum toll, which on twenty-six miles will make 52 cents as the daily toll for each ton of coal. So that the toll even on 100 tons of coal for 300 days per year, would nett a revenue of \$15,000, a sufficient sum to pay six per cent on the investment.

It may be necessary to remark, that no notice is taken of the transportation, which is distinct from the toll. If the transportation should be done by the company, they will of course so arrange their charges, as to gain expenses.

Among the sources of profit, we may estimate a considerable revenue from the lumber which will be transported on this Road, the supply of which article is very abundant and the variety extensive.

The income from Passengers, will be ano-

ther source of much profit, especially if this road is connected with the Williamsport and Elmira Rail road, now about to be commenced. Your Charter provides for this connection, and it would certainly be a very desirable one, which I am told can be effected in the distance of 14 miles.

The proposed Rail road from Jersey shore on the West Branch of the Susquehanna to Willardsburgh, would intersect your Road at or near Willardsburg, about 7 miles from the State Line, and whatever the amount of tonage might be on this road, you will be certain to receive a great proportion of it for transportation for at least one fourth part of the entire length of your road. One of the objects of the road from Willardsburg to Jersey Shore is to reach coal on Pine Creek, which has been discovered of good quality and very abundant.—The length of this road will be about seventy miles, and its direction from Willardsburg will be up the valley of Crooked Creek to Wellsborough, near the head waters of Crooked and Pine Creeks, then it will descend Pine Creek to its termination at Jersey Shore.

I deem it unnecessary to refer to the extension of your road into the State of New-York, with which you are acquainted, further than to state, that the work has been commenced on the 14 miles from the State line to Painted Post, where there will be a communication with the New-York and Erie Rail road at or near the head of the feeder of the Chemung Canal. As the extension is commenced under the charge of another company, to effect the same object, we have every reason to believe that they will prosecute their work to completion, as soon as you can finish the portion you are constructing—a coincidence highly important to the prosperity and interest of both works.

In concluding this report I acknowledge with much pleasure the valuable aid I have received from Mr. Miller Fox, the Principal Assistant;—Mr. William McDougall has also been a valuable member of the party.

Respectfully Submitted,

WILLIAM MATTHEWS,
Engineer of the Tioga Rail road.

TO THE PRESIDENT AND MANAGERS OF THE
TIOGA NAVIGATION COMPANY.

GENTLEMEN—I have examined the report of W. Matthews, Esq., Engineer, dated the 15th of August, 1836, in which he has given a full account of the progress of the Engineer Department of the Rail road between Blossburg and the New-York State Line and an estimate of the cost of the Road amounting to \$237,806 83.

I have examined the several items forming this estimate and consulted with Mr. Matthews, and compared minds in relation to the whole subject including the necessary engines, tenders, transportation cars, and passenger cars, water stations, &c &c. And I think the estimate a fair one and such

ought to complete the Road and put it in operation.

I therefore approve of this Report and its statements as correct.

BENJ. WRIGHT,

Consulting Engineer,

Tioga Navigation Co.

Lawrenceville, August, 15th, 1836.

TO THE PRESIDENT AND MANAGERS OF
THE TIOGA NAVIGATION COMPANY.

GENTLEMEN—Having visited the line of your proposed Railroad now under charge of Mr. Matthews, from Blossburg, to the New-York State Line near Lawrenceville; I now beg leave to present to your board, my views upon the whole plan.

It is proposed by Mr. Matthews, and approved by me to grade the Road for a single track,—with five turnouts. The cutting to be fifteen feet at bottom, which allows for one track, and good ditches or side drains. The embankments to be fifteen feet on the top, and the slopes to be one and a half to one, except where there is rock or earth, that will permit a steeper slope.

The superstructure to be of timber, laid first as ground sills, then cross ties, then wooden rails on which the iron bars are placed. The track I would propose to conform to the New-York and Erie Railroad, which is intended to be four feet eight and a half inches, between the rails.

The size of the several timbers having been before given to the road, by Mr. Matthews, and contracts made, therefore I shall not enter into detail—the turn-out I would plan as follows.

One near the northern termination at the New-York State Line, one near Willardsburg, one at Mansfield, one at Covington, and one at Blossburg. There can be added at any time hereafter such additional turn-outs, as the demands of the country require.

The line as located by Mr. Matthews, from Blossburg to Berry's Bridge, appears to me as far as a permanent location has been made, and from the experimental line below the permanent location to the point referred to above, near Berry's Bridge to be done with good judgment and such as I approve.

From near Berry's Bridge, to the N. Y. State Line there have been examinations and surveys on both sides of the river—distance nearly equal being about 8½ miles.

The comparative estimates which have been made by Mr. Matthews, present the following results:

On the west side graduation of road will cost,	\$40,279 00
Bridges over the Tioga and Crooked Creek,	\$6,600 00
Alteration of road at Depuy's,	500 00
	\$47,379 00
EAST SIDE.	
Graduation of road,	\$35,044 00
The land and fencing will cost	

more on the east, than on the west, equal to 1,334 00

36,428 00

Difference in favor of E. side, \$10,951

Thus we have a difference of ten thousand and nine hundred and fifty one dollars in favor of the East side.

This comparative view of cost, ought not however to be decisive upon this matter; a view ought to be taken of the commodation of the country; and the general advantages to the stockholders, and the future prospects of trade and business on the road.

If we pass across the river above Berry's Bridge, we pass through Willardsburg and through Lawrenceville, we accommodate these two villages, and we give a favorable connection to the proposed Railroad up Crooked Creek, to the West Branch of the Susquehanna at Jersey Shore, if it should be made and we facilitate an easy connection for the Railroad up the Cowanesque should the wants of the country hereafter require it.

On the other hand we have a bridge over the Tioga river, at or near Berry's, a bridge over the Crooked Creek, and as we ought in a certain degree to consider that part of the road to be constructed in the State of New-York, although never another charter so intimately connected as to have a bearing on the interest of this road. If we take the west side of the Tioga from Willardsburg, there must be a bridge erected by the directors under the New-York charter, over the Cowanesque and over the Tioga. The expense of these latter bridges cannot of course enter into any calculation under the Pennsylvania charter, but as far as risk of interruption of trade by the destruction of bridges in the New-York part of the line into the location on the Pennsylvania part, it is fair to consider its bearing. Thus we have the expense and rescue of two bridges in Pennsylvania, and the risk of interruption by the destruction of bridges on the New-York part of the line.

These are the offsets against the advantages of accommodation and trade of two important villages which are daily growing in trade. I regret gentlemen that a little more time had not been given for the Engineer to have made a more perfect comparison of cost of the two sides of the river, by obtaining a more correct estimate of damages on both sides. And a better estimate of the expense of bridges over such streams, as these which we must cross, on the route of the west side.

It appears to me, gentlemen, that your local knowledge of the present and future prospects of this country will enable you to determine this question more correctly than any Engineer. The data given above presents the question fairly as far as I can understand its bearing. The question of damages may however be misunderstood by me, and I make the estimate on that part with diffidence. There is one point which has suggested itself to my mind in relation to the guaranty of the State under the supplemental act of April 14th, 1835, which says, "the Road from Blossburg to Law-

renceville" it appears to me a question may arise, if the road does not touch Lawrenceville, as every law must be construed strictly. I however throw out this as the impression of my mind, and your better judgment will take it for what it is worth.

I have reflected upon the subject of iron rails, since, I have written Mr. Matthews, and sent him the form of rails which I would prefer. I find the price of iron has raised so much and the delays in obtaining any new pattern are so great, that I have consulted with Mr. Matthews and we have agreed upon altering the rails, and would now propose to the Board to adopt the common plate rail of two and one quarter iron, wide and five eights thick. This will make a saving of about four or five tons per mile in the weight of the rail.

I have now to touch upon a subject which perhaps the Board may consider as settled by their act, and therefore not properly belonging to the engineer. I mean the location and termination of the road at Blossburg.

The experience of all railroad companies, has pretty well settled the importance of one very large depot for the establishment of work shops to repair locomotive engines, and cars. The location and business of the road would seem to point out that an establishment for this purpose should be made at Blossburg, and another at the point where it terminates on the Chemung Canal Feder. If the Board should determine upon such a depot for work shops, car houses, &c. &c, they ought to have fifteen or twenty acres of land, and the privilege of a small water power for the work shops.—In looking over the ground about Blossburg, it is easy to select such place as would furnish ground suitable, and water power, which can now be obtained, as I am informed, at fair prices. I would therefore beg leave to recommend to the Board the propriety of securing at an early day such location of ground as shall be required there.

In carrying on a great coal trade such as this work will no doubt have, as soon as this project is completed, there will be at least three or four hundred cars kept on hand, some out of repair and the remainder in use.

If one locomotive can take down one hundred tons of coal in 40 cars, and return with the empty cars, there ought to be estimated at least three hundred tons per day, taken down.

Then for one locomotive.

40 cars on the road,
40 cars unloading, and
40 cars loading,

120 cars required for each locomotive. Then three locomotives will require 360 cars, and making allowance for cars in the work shop, and we shall find 400 cars rather less than the absolute wants required to carry 300 tons daily to the canal. The Board will see from this view of this matter the very great necessity of securing plenty of room for the work shops and for these cars to be collected at the southern termination of the road, these together with

the mass of materials of wood and iron necessary to have in store require space, and if 20 acres could be obtained in good form for this purpose it will be very important to have it secured.

Respectfully submitted,

BENJ. WRIGHT.

Consulting Engineer.

Covington, May 5th, 1836.

From the Farmville Journal.

CHARLOTTE RAILROAD CONVENTION.

It will be seen from the sketch which we have published to-day of the proceedings of this Convention, that they have recommended a railroad to be constructed from Farmville to Danville, from Farmville to Petersburg by the way of Nottoway Court House, and from Richmond to Farmville and thence to Lynchburg. There was much diversity of opinion, as was to be expected in such a body, respecting the routes which the railroads should pursue, but none as to the propriety and importance of a great railroad communication from the tide water to the southwest.

The objections to the recommendation of the direct Richmond route seemed principally, to be the probability, and, almost certainty, that it will not be chartered by the Legislature—and that the road might be constructed from Farmville through Petersburg, to Richmond, with less expense, and little increase of distance, giving to the planter the choice of an additional market, and conflicting so little with their favorite James river monopoly, that it could hardly be doubted that it would be able to secure a charter from the Legislature. We would not willingly believe, that there is no expectation on the part of the Richmond people of obtaining a charter for the road through Farmville to Lynchburg, and that their only object is to prevent the construction of the road through Nottoway to Petersburg, until some future period when they may be able to procure a charter from the Legislature for the ridge road from Lynchburg. We fear, that whatever may have been intended, this will be the result. We hope that the people of Petersburg and Nottoway will not so lightly give up a scheme, which is so intimately connected with their interests.—For ourselves, we do not believe that the ensuing legislature will charter the ridge road from Richmond to Lynchburg through Farmville. We hope therefore that the route by Nottoway Court House, will be forthwith surveyed, and its claims be presented to the Legislature—that if the influence of the James river Company should prevent the charter of a road from Richmond to Lynchburg direct, we might still present them claims free from all rivalry to that Company, by interposing the Appomattox between them. We do not feel at all certain, that both roads would not be well sustained.

A Convention is called to meet soon, at Salisbury, in North Carolina, to take steps for opening some channel of communication to the country bordering upon the Yadkin, and there is a good deal of probability that they will recommend the construction of a railroad to Danville. Should the roads from Farmville to Danville and to Lynchburg be constructed, there will be travel enough we think, to support both routes, and we see no reason why the Petersburg road might not expect to divide the travel with the other route, and secure a reasonable proportion of it. We hope, therefore, the people of Nottoway and Petersburg will not

"give up the ship." Faint heart never won fair lady, and in the present age of activity and enterprise, commercial advantages are not to be secured without strenuous and enduring effort.

CHARLOTTE CONVENTION

At a meeting of delegates of the Counties of Prince Edward, Charlotte, Nottoway, Amelia, the town of Farmville, and the city of Richmond, at Charlotte Courthouse on the 5th day of September, 1836, for the purpose of taking into consideration the propriety of constructing a railroad from Danville in the county of Pittsylvania, to Farmville in the county of Prince Edward.

The meeting being called to order, Colonel Clement Carrington was appointed Chairman, and Branch J. Worsham Secretary:—whereupon the following delegates appeared, to wit; from the city of Richmond, J. B. Harvie and Wm. Wren; from Farmville, Tazewell S. Morton, Henry Thweatt, Nahamuel Price, Wm. L. Morton and James Madison; from Prince Edward county, Richard N. Venable, James H. Wilson, Branch J. Worsham, Henry E. Watkins, Wm. H. Venable, Wm. S. Morton, James D. Wood, John J. Flournoy, John A. Scott, and John Clark; from Amelia county, Thomas E. Jeter; from Nottoway county, Archibald A. Campbell, Robert Fitzgerald, Jun., Wm. N. Fitzgerald, John H. Knight, Peter I. Gregg, L. C. Bouldin, and W. J. Dupuy; from Charlotte county, Dr. A. D. Alexander, Robert Morton, J. D. Richardson, Wm. B. Green, Richard I. Gaines, John Armistead, Henry A. Watkins, Edward W. Henry, George Hannah, Henry E. Scott, Thomas Edmunds, Isham Harvey, J. Boothe, John Harvey, Samuel D. Morton, Dr. John Armistead, Henry Madison, John D. Spraggins, Clement Carrington, and William B. Watkins.

On motion, Dr. Piman B. Spencer of Petersburg, was invited to take a seat with this Convention, and accordingly appeared and took his seat.

The Convention then proceeded to elect a President, and Col. Clement Carrington being nominated, was unanimously elected.

Mr. Watkins, of Prince Edward, submitted the following resolution:

1. Resolved, That this Convention recommend the construction of a railroad from the town of Danville to the town of Farmville, to pass through the county of Charlotte by or near the Court house.

Mr. Harvie submitted the following resolution:

2. Resolved, That it be recommended by this Convention, that a railroad be made from the city of Richmond to the town of Lynchburg or New-London, with a branch from the main stem to Farmville.

Mr. Campbell submitted the following proposition:

3. A proposition of a railroad from the neighborhood of Petersburg to New London, on the ridge dividing the waters of the Appomattox and the Albemarle sound, with branches to Farmville and Danville.

Mr. Watkins of Prince Edward, also submitted the following resolution:

6. Resolved, That this Convention recommend the construction of a railroad from Lynchburg to Farmville.

On motion of Mr. Gaines the several resolutions and propositions were referred to a Select Committee, to be composed of one delegate from each county, town and city, represented in this Convention.

The Chair then announced the Select Committee as follows: Mr. Edward Watkins, of Prince Edward, Mr. Harvie of Richmond, Mr. Madison of Farmville, Mr.

Jeter of Amelia, Mr. Campbell of Nottoway, and Mr. Gaines of Charlotte.

Mr. Madison submitted the following:

That the Committee be directed to inquire into the expediency of surveying a route for a railroad from Petersburg by Nottoway Courthouse, Burke's &c. to the town of Farmville.

On motion, the Convention then adjourned to meet again to-morrow morning at nine o'clock.

TUESDAY, SEPTEMBER 6th, 1836.

Convention met agreeably to adjournment.

The President being absent, on motion, Wm. S. Morton was elected President pro tempore, and took the chair.

Mr. Watkins, from the Committee to whom was referred the several resolutions presented yesterday, made the following report thereon:

Your Committee report the following resolution to be adopted by the Convention, as a substitute for the 1st resolution referred to him:

Resolved, That this Convention recommend that an application be made to the next general Assembly for the passage of an act incorporating a company for the construction of a railroad from Farmville, by or near Charlotte Court-house, to some suitable point on Staunton River, with the privilege of extending said road to Danville if it should be found expedient. Your Committee recommend that the 2d, 3d, and 5th resolutions referred to them, be rejected by the Convention.

Your committee report the following resolution to be adopted by the Convention, as a substitute for the 4th resolution referred to them—Resolved, that it be recommended by the Convention, that surveys be made, for a railroad from Petersburg to Farmville, the one by Nottoway Courthouse, the other through Amelia.

Your Committee recommend that the 6th resolution referred to them be adopted by the Convention.

Mr. Watkins of Prince Edward moved to reject so much of the said report as proposes a substitute for the 1st resolution referred to the committee.

Mr. H. A. Watkins of Charlotte moved to amend the substitute reported by the committee, by striking out the words "by or near Charlotte court house," and inserting the words "by the most eligible route."

Mr. Green offered to amend the amendment offered by Mr. Watkins of Charlotte, by striking out the words "by the most eligible route," and inserting the words "by Charlotte court house." The question was then taken on the amendment offered by Mr. Green, and rejected. The question was also taken on the amendment offered by Mr. Watkins of Charlotte, and rejected.

The question was then taken on the amendment of Mr. Watkins, of Prince Edward, and decided in the affirmative; so the substitute reported by the committee of the first resolution was rejected, and the resolution as originally submitted, agreed to.

Mr. Harvie moved to reject so much of the report of the select committee as recommends that the 2d resolution be rejected by the Convention, and offered as an amendment to the 2d said resolution and report the following:

Resolved, That it be recommended by this Convention, that a railroad be made along the ridge between James and Appomattox Rivers, from the city of Richmond to Lynchburg or New-London, with a branch road from the main stem, from the most convenient point to Farmville.

Mr. Watkins of Prince Edward, moved to lay the resolution and amendment on the table, which motion was rejected; and the question being taken upon the adoption of the amendment offered by Mr. Harvie,

Mr. Campbell called for the yeas and nays, which were ordered, and are as follows:

Yeas—Messrs. Harvie, Wren, Wilson, Worsham, W. S. Morton, Flournoy, Alexander, Green, Gaines, H. A. Watkins, Scott of Charlotte, Edmunds, Isham Harvey, and Morton of Charlotte—14

Nays—Messrs. T. S. Morton, Thweatt, Price, W. L. Morton, J. Madison, R. N. Venable, Watkins of Prince Edward, Wood Jeeter, Campbell, R. Fitzgerald, Knight, Grigg, Bouldin, Dupuy, Henry, Boothe, J. Harvey, M. Madison, Spruggins, Wm. B. Watkins—21.

So the amendment offered by Mr. Harvie was rejected.

Mr. Harvie then offered a second amendment to the 2d resolution and report, which is as follows:

Resolved, That it be recommended by this Convention, that a railroad be made along the ridge between James and Appomattox rivers, from the city of Richmond to Farmville, and thence to Lynchburg.

The question on the adoption of the resolution was taken and decided in the affirmative—yeas 19—noes 11.

So much of the report of the Select Committee as relates to the 3d and 5th resolutions referred to them, being read, and the question taken thereupon, was concurred in.

So much of the said report as relates to 4th resolution being read, the question was taken thereupon, and the report of the select committee as rejected; the question then recurring upon the adoption of the 4th resolution was originally offered, and the vote taken thereupon, was decided in the affirmative.

On motion of Mr. Watkins of Prince Edward, leave was given to withdraw the 6th resolution.

On motion of Mr. Gaines, Resolved, that a Committee be appointed in the counties of Charlotte and Prince Edward, consisting of five persons in each county, to raise a fund to defray the expenses of a survey of the proposed route for a railroad from Farmville to Danville.

The Chair then announced as a Committee for the county of Charlotte—Dr. A. D. Alexander, Richard I. Gaines, Edward W. Henry, Samuel D. Morton, and Henry Madison; For the county of Prince Edward—James H. Wilson, Wm. H. Venable, James D. Wood, John A. Scott, and John Clark.

Mr. Wren offered the following resolution, which was unanimously adopted:

Resolved, That the thanks of this convention be tendered to the President pro. tem., and Secretary, for the prompt, zealous and impartial manner in which they have discharged their duties.

On motion of Mr. Knight, Resolved, that the proceedings of this convention be published in the Farmville, Danville, Richmond and Petersburg papers.

The convention then adjourned sine die.

WM. S. MORTON, Pres. pro. tem.

B. J. WORSHAM, Secretary.

RESOLUTIONS ADOPTED.

1. Resolved, That this convention recommend the construction of a railroad from the town of Farmville to Danville, to pass through the county of Charlotte by or near the court house.

2. Resolved, That it be recommended by this Convention that a railroad be made

along the ridge between the James and Appomattox rivers from the city of Richmond to Farmville and thence to Lynchburg.

3. Resolved, That this Convention recommend the construction of a railroad from the town of Farmville to Petersburg, through the county of Nottoway by or near the court house.

The following article from the Staunton Spectator, will exhibit the spirit which actuates the people of Augusta in reference to the Valley Railroad:

VALLEY RAILROAD.—On Monday last, pursuant to notice, books were opened at the Court House of this county, for subscriptions to the stock of the Valley Railroad.—There was quite a respectable attendance of citizens on the occasion. A. H. H. Stuart, Esq., addressed the people at great length and with much ability, in favor of the enterprise—going fully into the advantages of the improvement, its effects upon the prosperity of the country, the objections urged against it, and the necessity for present and decided action on the subject. We are sure we speak but the general sentiment of those who heard him, when we say, it was one of the best efforts of our gifted townsman. Mr. Stuart concluded his speech about 5 o'clock, and from that time until sun-down there were \$65,000 subscribed. The books are still open, and if the people of the county are only true to their interest, we have no doubt the amount expected of us will be obtained in a few days. We congratulate the friends of the improvement on the cheering prospect.—For is it not cheering? If fifty-eight citizens give a subscription of \$65,000, who can doubt that one hundred or one hundred and fifty thousand more will be taken by the balance of the country! Are there not a thousand citizens at least, who could and ought to make an average subscription of two shares each? We have heard of two gentlemen who were not present on Monday that will take between them seventy shares, and there are no doubt many others who will subscribe from five to ten. Nothing, we are persuaded, is now wanting but a moderate degree of exertion to obtain the requisite subscription on our part. Then shall we slumber and sleep, or waste our time in idle chat over what we have done,—or shall we seize the crisis, and with a spirit worthy of the noble enterprise, push on with freshened zeal and untiring energy to its accomplishment! Remember, the prize is not won, though it be within our grasp.—Once more, then, unto the breach, dear friends, once more! If nothing else will do, let us district the county, visit every house, and make thorough work of it.—[Spectator.]

From the London Mechanics' Magazine.

EFFECTIVE POWER OF LOCOMOTIVE ENGINES ON LEVELS AND INCLINED PLANES.

Question put to Mr. Robert Stephenson, C. E., by the Committee on the London and Brighton Railway; and Mr. Stephenson's Answer.

QUESTION.

Supposing that for a long distance there is a certain strain which may be represented by any figure or letter, and that that is broken on another line by a series of ascents and descents; supposing that the total amount of strain in both instances be the

same, what is the difference of effect upon the engine?

ANSWER.

In order that the following answer may be fully comprehended, it is necessary to premise, that by the terms of the question, it would appear that it is meant to determine the difference of effect of locomotive power upon two series of planes, from a point A to a point B. In the one the strain is constant, and may be represented by 1, whilst the other is varied by ascents and descents, but so that the total expenditure of mechanical power is the same; hence it is evident that the ascents upon the latter must be more abrupt than on the former, or else they would not compensate for the descents.

Assuming these data, there cannot be a question that the lesser and more uniform strain is best adapted to locomotive power, both as regards speed and load, for the following reasons:—

1st. As regards speed. It is evident that, to render this comparison perfectly fair, it is only necessary to assume two engines of equal power and load to start simultaneously from A to B, and then assuming that on every part of each line the engine to be capable of exerting its whole power, that is, both on the ascents and descents of the undulating line, while she proceeds uniformly on the other line. On this assumption, as equal power will be so exerted in equal times by each engine, and as the total expenditure between A and B is the same, they would then both arrive at B together.

But in the case of the undulating line, this hypothesis cannot hold, except within certain limitations, for it is manifest that in practice a variety of circumstances limit the speed at which an engine can be allowed to travel, both as regards safety, wear and tear of machinery, and also the arrangement, especially of the slides for the admission of steam to the cylinders.

For these and other reasons, a speed of 35 or 40 miles per hour is as much as can be travelled safely, especially on descending planes, in the present state of our experience; hence, in order to compensate for the slowness of ascending speed, the accelerated velocity may be far beyond that which can be permitted with prudence; hence the difference of time consumed on the descending planes by the regulated velocity, and the extreme accelerated velocity is lost on the undulating principle.

For instance, between London and Brighton, by Sir John Rennie's and Mr. Stephenson's proposed lines of railway, the respective distances from London Bridge to Sir John Rennie's terminus at Brighton is 49 miles, 68 chains; and from Nine Elms to the back of Brunswick-terrace, by Mr. Stephenson's line of railway, is 54 miles, 68 chains; and going and coming the respective distances, therefore, are 99 miles, 56 chains, and 109 miles, 56 chains.

There are on Sir John Rennie's line, as described by Dr. Lardner, 32 miles of gradients to be characterised by $\frac{1}{10}$.

On Mr. Stephenson's, 28 miles by $\frac{1}{10}$. Now assuming an engine to start on each line of an equal power and with the same

load, with which load on the level it can travel at a speed of 40 miles an hour, using its whole power, then assuming the friction to be 9 lbs. per ton, or $\frac{1}{10}$, and that its whole power is consumed, the distance to and from Brighton will be travelled on each at a speed of 40 miles per hour, and the respective times will be 2. 29. 30. and 2. 44. 30. without adding for delay on the Croydon inclined plane.

But this assumes that on Sir John Rennie's descending planes the engine to travel 720 miles per hour. Whereas we will suppose them limited on each to 40 miles per hour; hence in going and coming there will be 32 miles of descending planes, the time to be added will be the difference between travelling 32 miles, at 720 miles per hour, and at 40 miles per hour, that is, of 45 minutes, 20 seconds, making the total 3. 14. 50. by Sir John Rennie's line; whilst on Mr. Stephenson's the time to be added is the difference between travelling 28 miles at 16 miles per hour, and at 40 miles per hour, that is, of 31 minutes, 30 seconds, making the total time 3 hours, 16 minutes.

To this must be added the time consumed in stoppages, that is, on Stephenson's 2 + 3 minutes, being once at the Southampton Junction, and once for water. On Sir John Rennie's, 3 + 3 = 9 minutes, being once at Greenwich Junction, once Croydon at the station, and once for water; besides delay on Croydon incline, for which 5 minutes will be a very moderate allowance.

Thus by Rennie's line . . .	3 14 50
Extra stoppages . . .	14 0
	<hr/> 3 28 50

By Stephenson's	3 16 0
Extra stoppages	6 0
	<hr/> 3 22 0

The difference being 6 minutes, 50 seconds, in favor of Stephenson's line. This is abstracted from the curves; now, Dr. Lardner admits that the total curvature

On Rennie's is measured by 840 deg.
And on Stephenson's, by 790 do.
Or, reduced to curves of a mile,
Rennie's . . . 7 miles, $\frac{3}{4}$ of a mile radius.
Stephenson's 6 $\frac{1}{10}$ ditto.

22

Thus the total length of the respective journeys —

On Rennie's	3 36 30
On Stephenson's	3 29 0

But it may be well here to remark, that Dr. Lardner is in error as regard the curvature on both Stephenson's and Rennie's line; as the curvature

On Rennie's is . . . 15 m., 1 m. radius,
And on Stephenson's 11 $\frac{1}{2}$
which would make the time a little more favorable to Stephenson's line of railway.

Now, it may be observed, that the foregoing calculations are altogether independent of a difference of opinion as regards proportion of power of engines to what they are ordinarily called upon to exert,

or of their varying power at different speeds, because this is equally applicable to each line; but rest upon clear mechanical principles, independent of all hypothesis.

Next, if the comparison be as regards load, then the thing is very simple; for the load is either measured by the adhesion of the wheels, or else by the pressure of steam in the cylinder; in either case, the engine being identical in power and weight, the maximum load is measured by the friction on a level plus gravity; hence the uniform or more easy gradients have a clear advantage.

Thus, between Sir John Rennie's and Mr. Stephenson's lines, the proportions are as

$$15.80 = 9 \times 6 + 80 = \left(\frac{2240}{330}\right) \\ \text{to } 17.50 = 9 \times 8 + 50 = \left(\frac{2240}{264}\right)$$

That is, a difference of 11 per cent. in favor of Mr. Stephenson's line in gross load; but the effective load has a different proportion still more favorable to Mr. Stephenson's line, as Mr. Rastrick admitted in his evidence, a difference of 14 per cent. in favor of the western line, but which may under various considerations amount to 20, or even a higher per centage.

From the Journal of the Am. Institute, for August.
REPORT FROM THE HON. HENRY L. ELLSWORTH TO THE SECRETARY OF STATE, AND TRANSMITTED TO THE SELECT COMMITTEE ON THE PATENT LAWS.

PATENT OFFICE, 1836.

SIR: I have the honor to acknowledge the receipt of the inquiries made by the honorable chairman of the committee on the patent office, in the house of representatives, and referred by the honorable Secretary of State to this office for my report in part. As the answer must in some measure depend upon the organization of the office, I will respectfully reply, first, to the following inquiry, viz: "what alteration or improvement of the law, relating to the granting of patents, has experience shown to be requisite to effect all the objects which it is desirable to obtain in this department?" A brief reference to the history of the patent law, and the practice under it, will be necessary to learn the "mischief," and provide the "remedy."

It is nearly half a century since the present patent law was enacted. Previously to 1793, all petitions for patents were presented to the Secretary of State, Secretary of War, and Attorney General, who examined them, and granted or refused a patent at their discretion. This duty having been found an arduous one, and also a great interruption to other business, the law of 1790 was repealed, and the present act passed, which is more in conformity with the practice in Great Britain.— Few alterations have been made in the existing law since 1793, if we except the extension of a privilege to a certain class of foreigners. While a laudable spirit prompted our legislators to encourage the arts, the poverty and distresses of the country forbade the passage of any law for the protection of inventors which might increase the burdens of the community. Such a tariff of fees was accordingly established as

to defray, as far as possible, the expense incurred by government in giving patents. Hence it is not strange, that glaring imperfections now appear in the law. It has been a matter of astonishment that so important a branch of domestic polity should have been so long neglected. The time has now arrived when the amount of revenue derived from this source, the magnitude of the claims dependant upon the patent law, the great delay and embarrassment experienced by patentees at the office, all conspire to demand a thorough survey of its present organization. To insure attention to this subject, it need only be mentioned that the number of patents issued annually, for a long time, did not exceed one hundred, whereas, at present, the number is about eight hundred, and will soon increase to one thousand. Such is the desire to secure patents, that individuals have taken out more than fifty patents. The amount of fees for patents annually (\$30 being the fee) is about \$25,000. The present year it may exceed \$30,000. To this amount fees for copies and recording are to be added, making the sum larger still; and notwithstanding the rapid increase in the business of the office within a few years, very little additional force has been allowed for its accomplishment. Patentees complain of delay, and very justly, but this delay must soon be greater than at present, without the interference of congress. It may be asked if such are the profits, why not apply the funds received to the discharge of accruing business?— The answer is readily given. All the money received is, by law, paid over into the treasury, and although to be credited to "the account of clerk hire," cannot be appropriated to this use without a special act of congress. The superintendent has requested additional assistance, but the honorable Secretary, although anxious to afford every facility, has not felt authorised to increase the expenditures on his own responsibility. Patentees and suitors in courts have suffered much during the last year from delays in the office; cases are sometimes continued for the want of copies, which would readily be furnished at one half the lawful fees now charged if the superintendent was permitted to get the work done. A few facts need only be added, to show the propriety and importance of a revision of the patent law. The whole expenses of the patent office do not exceed one-fourth of its income. The number of applications for patents since the 10th of July (at which time my superintendency commenced) has been upwards of six hundred. The correspondence has trebled within a few years. No less than two thousand letters have been written by the superintendent since July last. More than one hundred suits are now pending in the United States courts touching rights of patentees. These suits will increase until some check is put to the fraud now openly practised, but irremediable without the aid of congress.

Questions are frequently asked at the patent office, which require several days search to answer. Each patentee (if he is honest) wishes to know whether his patent

will infringe upon others. This is apparently a simple inquiry, but only a reference to seven thousand patents can settle the question. And here, what an embarrassment must arise from the want of systematic arrangement of the papers. Previous to July last, not a single letter received was filed, and even now none are indexed. Many volumes of records are also wholly unindexed, and must remain so until more help is provided. And was not an hourly reference to these volumes and correspondence necessary, the unsystematic arrangement of papers would be less tedious and perplexing.

The injustice and inexpediency of the present law, will appear in reference for the charges made for services performed at the office, besides the fee of thirty dollars. By the law of 1793, each copy of one hundred words is charged at twenty cents, certainly twice as much as it costs to make the copy, if labor is computed at one thousand dollars or twelve hundred dollars per year for a clerk. It may be mentioned, as a singular fact, that copies of the papers in the State department, are charged only ten cents per one hundred words. Each drawing, whatever its size or complexity, is charged at two dollars. A few drawings are worth less than this sum, but most of them twice as much, and some are worth forty or fifty dollars. A fair remuneration ought to be charged to each applicant.—There are now applications pending for drawings, where the draughtsmen will be compelled to labor several days, at a salary of three dollars and thirty-three cents per day, and earn for the government but two dollars for the whole time.

So sensible are the patentees that the price is much less than the usual charge for the same thing out of the office, that they frequently apply to the superintendent to get the original drawings executed in the office at two dollars. This request is always refused, for patentees are bound to furnish original drawings, and the patent office is only required to give copies of drawings of patents granted.

The delay of patents has been alluded to. This is one of the greatest evils. Applicants are always impatient; some travel to this place from a long distance, and are anxious to carry their patents home with them; other patentees are urgent for papers to be used in courts; especially where old patents are adjudged invalid, and the right of action is suspended until a new patent is obtained; nor will an additional number of Clerks produce the desired relief, without some alteration of the present requisites. According to the existing law, the patent must be signed by the *President*, the *Secretary of State*, and the *Attorney General*.

The Attorney General has the right to retain the patent fifteen days for examination. It must be apparent to all conversant with public business, that there will be delay in the signatures of such high functionaries, since their time is demanded for more important duties. How much greater must this delay be, when the person whose signature is wanted, is absent from the seat of government; nearly one half of the pat-

ents issued since July have been transmitted more than two hundred miles for single signatures. It may be asked, how is this difficulty to be remedied? it is believed that two of the three signatures can be dispensed with; can it be necessary or useful to have the whole number?

The rights of the patentee are the same with the signature of the Secretary of State, as with the addition of the President and Attorney General. The great seal can accompany the Secretary's signature, and the patent be issued in the name of the United States. It is true the Attorney General is bound to examine the patent; but is this necessary? Among all the patents transmitted since July, only one has been returned as imperfect, and in this case the defect was not fatal to the validity of the patent. The best examination can certainly be made at the patent office, where the drawings and models are deposited. If the signature of the president and Attorney General could be dispensed with, considerable labor and much interruption would be avoided. If additional help was given to examine the patent and the signatures of the Secretary of State, and the head of the bureau, only required, it is believed that a patent might be issued in a few days, whereas now the average time is two or three months.

The present arrangements are not economical. Congress appropriated, a few years since, \$14,000 to bring up the records of the office by employing clerks at a compensation not exceeding twelve and a half cents for every hundred words. A small part of this appropriation remains unexpended, and a temporary clerk is employed under the act. The employment of temporary clerks is objectionable: unskilled, they are liable to commit errors; besides, the compensation of twelve and a half cents per hundred words is much higher than the salary of a clerk at \$1,000 or \$1,200. It is due to those who labor in the patent office to state, that services required and performed there are not exceeded in any of the bureaux of government. Great caution, much skill, and some legal science, are requisite in issuing every patent.

Notwithstanding the superintendency is in form a separate bureau, (yet in law a clerkship,) and the superintendent charged with the whole responsibility of issuing the patents, disbursing the special appropriation of \$14,000, and the contingent fund of \$2,000, accountable for all the fees received in the office, and personally required to conduct the correspondence, still his compensation is lower than that of chief clerk in either bureaux of auditor or commissioner. If the patent office was placed upon the same footing with the land office or Indian bureau, the compensation allowed would secure competent assistance. And it is desirable that those who are in the office should receive a fair remuneration as an inducement to remain after they have become acquainted with its minute details. The salaries in the patent office, as compared with those of the land office, Indian bureau, or either auditor's office, will be

found from thirty-three to fifty per cent. less. Hence there is in the patent office a constant desire to change situations, and this comparatively low compensation will prevent able and permanent assistance.—Will a clerk remain satisfied to labor for \$1,000 in the patent office, when the same clerical services in adjoining offices bring \$1,250 to \$1,500. The aggregate pay of superintendent, three clerks, machinist, and messenger, in the patent office, amounts to \$5,400, whereas the pay of the commissioner of Indian affairs, four clerks, and a messenger, is \$3,700. One third of the revenue received from patents would defray all the disbursements for salaries, and leave two thirds to be appropriated as congress might direct.

I have alluded to frauds under the patent law. These frauds are daily practised by persons who take out patents without making any new discovery or improvement.—The law gives neither the superintendent nor others any judicial powers. Every applicant has a right to demand a patent if his papers are in order; and several patents are often issued for the same thing. Congress seemed to have noticed the impropriety of granting two patents for the same thing by giving the Secretary power, in case of two pending interfering applications, to order them both to arbitration to decide upon the right of patent, but under the rules established to direct the office no applications are deemed interfering unless the papers of both are complete in all respects.—Should two applications be precisely alike, and one of them need only a trifling requisite, such as an additional witness, it then would be no interference; and as there is seldom a case when the papers of both are in the same state of forwardness, an arbitration under the law is a rare occurrence.

The oath of inventors has been too often justly compared to the "custom-house oaths." There are, however, inventions made by persons living in different parts of our country, when both can claim originality; for no sooner are the wants of the public known than men of ingenuity attempt to supply them. The late burning of baggage on railroad cars produced immediately many inventions to remedy the evil, and several interfering applications were made. The issuing of patents to those who have no claim to originality is truly a great evil. Every facility is now extended to pirates. Even copies of models are taken by visitors at the model rooms, and patents demanded of a similar kind. During the last week a patentee was explicitly told that his patent, if granted, would be a direct infringement upon previous patents: "but a patent must be had;" it was demanded, and accordingly ordered to issue. It is believed that several hundred thousand dollars are paid annually in the United States for patents improperly obtained.

The success of past villany has emboldened many to continue their deception upon the credulous. The public attach high reverence to the great seal which the patentee is careful to exhibit. Fraudulent patentees are shielded in some measure by the expense of litigation, and many, very

many, pay commutation, and submit to imposition, rather than be dragged into courts of justice. How easily, for instance, can an individual take out a patent resembling one granted to a citizen of Maine, and sell the same in the south-west part of the republic! An arrest of the infringer might be uncertain, and indemnification still more doubtful. The pirate, after selling out his rights to States, counties and towns, might easily pass over the borders of our territories and be safe. There are a great number of cases arising out of the patent law before the United States courts. How much will the number be increased when the eight hundred patents granted this year shall appear with their many interfering specifications? There will be a rich harvest for the lawyers; but how many honest mechanics and inventors will be ruined by the expense of litigation. Is there no remedy?

The remark of Mr. Jefferson, who, while Secretary of State, was one of the board of examiners of patents, is worthy of observation. In his letter to Mr. Cooper, on this subject, he writes, "instead of refusing a patent in the first instance, as the board was authorised to do, the patent now issues, of course, subject to be declared void on such principles as should be established by courts of law. The business, however, is but little analogous to their course of reading, since we might in vain turn over all the lubberly volumes of the law, to find a single ray which would light the path of the mechanic, or mathematician. It is more within the information of a board of academical professors, and a previous refusal of a patent would better guard our citizens against harassments by lawsuits. But England had given it to her judges, and the usual predominancy of her examples carried it to ours." I would respectfully suggest the following remedy: To vest in the head of the patent bureau, or some other tribunal, a discretion to arrest a pending application for a patent, if it interferes with any prior patent, or caveat on file, and also if the application is destitute of novelty.

If scientific men could be induced to take an office in the patent bureau, as examiners of patents, their examinations, aided by a suitable library, would detect almost every interference or want of novelty. Nor is it to be believed there will be any objection to appropriate the sum necessary to obtain a good library.

To show the importance of possessing the foreign works of art, on the subject of patents, I would remark, that in looking accidentally at a German work, a discovery was there found, delineated in a drawing, which has been patented in this country, and which is now selling as a new invention. A complete collection of prints and books, in reference to the patent law, would be highly useful to patentees, and citizens in general, as well as the courts of justice. Caveats in the United States, though frequently entered, give no protection to the inventor. The existence of the caveat can be attested as evidence of certain knowledge at the date of the same, but proof furnished from the patent office gives no additional weight to the testimony. In Eng-

land a caveat protects the inventor from interference for a certain period, during which time, if any interfering application is made, the person who entered the caveat is notified. An *ex parte* hearing is had before the Attorney or Solicitor General, who decides upon the case; if there is an interference, one of the applications is rejected.

I ought, however, to remark, that such in England is the danger of giving publicity to inventions before signing the patent, that caveats are kept secret. Indeed, so great is the anxiety to conceal from the public the discovery, that the letter of the invention is sometimes only lodged for a caveat, as for instance: "New improvements on steam engines," "spinning cotton," "navigating vessels," &c. Great importance is attached to the novelty of the invention; hence, when artists in the employment of an inventor have mentioned to a stranger the discovery, and that stranger has by dexterity set up a model of the same, even after application for a patent, and before signing it, the patent has been lost for want of novelty. Our courts have adopted a more liberal policy, and very justly decided that public experiments to test the value of the invention, do not destroy the right on the ground of publicity.

In conformity with the established decisions of this country, a caveat, if recognised by law, could be safely lodged on file, describing (as fully as possible) the whole invention, to protect the inventor against interfering applications. Our law also makes novelty a requisite for a good patent. Many have supposed the example of England and other foreign governments worthy of imitation by us. Patents in England are not confined to new discoveries there, but granted upon importation, or introduction of discoveries from abroad, and this is done upon the principle, that the arts will be benefitted by the encouragement afforded. On this point much might be said. When this system was adopted in England, communication with other countries was comparatively limited, and the improvements in the arts correspondingly low. But at the present time, such are the facilities of intercourse, and such the reading spirit of the people of the United States, that it is evidently better to confine patents here to new discoveries.

Scientific journals bring speedily to our shores every invention from abroad, and these inventions are introduced into immediate use, with barely the cost of manufacture. Who except the patentee would be benefitted by the issue of a patent for a foreign invention? thereby increasing the price at least thirty-three or fifty per cent. There would seem no occasion for offering further bounty to patentees. During the last sixty days, more than two hundred applications have been made for patents, a number greater than the average number issued annually in England for the last ten years.

I cannot omit noticing one thing more, viz: in the failure of the patentee to sustain his patent, if he claims more than is original, or presents a defective description. The description of the whole object, how-

ever limited the improvement, is a common error. The patentee knowing fully the extent of his own discovery, or improvement, ought certainly to specify the same with perspicuity. Cases will arise, however, where (in a large machine for instance) some small part described might not be new. Here a trifling error destroys the patent. While there is no sympathy for fraudulent patentees, who attempt to deceive the public by patented discoveries, there is some feeling for an honest mechanic, who, having published his patent, and believing it to be correct, is not only deprived of recovering any damages of the infringer, but obliged to pay cost to a defendant, who has enriched himself by the discovery of the plaintiff. In England an effort is making to prevent a total failure of action for partial defects, by authorising certain disclaimers to be put in a subsequent procedure to judgment. The principle upon which surrendry of invalid patents is permitted in this country, is an expeditious mode of correcting errors arising from "mistake," or "inadvertence." And if a discretion was allowed to the court, to tax or withhold costs in favor of the defendant, our practice would be more simple than the complex pleading, which disclaimers must introduce. Such is the temptation to patent in this country, that it might be well to compel each patentee to publish his specification, or at least his specific claim.

We can scarcely eat, drink, sleep or work, without using some patent. Take for instance the farmer; he dares not use a plough without paying for the patent right, when, perhaps, the only new thing claimed in the specification of the patentee who offers this fine plough, is a simple *bolt*.—While cupidity induces patentees to connect their improvements with inventions of others, ostensibly claiming all as their own, it is certainly proper that the government should annex some penalty to such imposition. A judgment against the validity of the patent, is a suitable penalty. Should it appear objectionable to confer the power of arresting interfering applications on the head of the patent bureau, &c., the objection may perhaps be lessened, by referring the interference to three indifferent arbitrators, skilled in the art in question, and as the arbitrators might make an improper award, an appeal could be allowed to the Secretary of State, or other tribunal. The present mode of appointing arbitrators in interfering applications, is to allow each party to choose one, and the Secretary of State the third. This makes a court of strong bias, as each applicant generally selects a particular friend. I ought to add that, at present, there is no compensation allowed or paid to arbitrators. Each appellant might be required to pay a reasonable fee, to be fixed by law. Interferences will generally be found to arise from ignorance or fraudulent intent. Information will correct the former, while a rigid scrutiny will induce impostors to withdraw their pretensions. It should be recollected that the first applicant is not always the original inventor; those who pirate upon inventions are generally dexterous in securing their

patents as soon as possible. In such case, where the honest inventor has not been guilty of gross neglect, equivalent to a legal abandonment of his right, the superintendent might allow the patent to issue, and the rights of parties would be settled in a court of justice; these cases will, however, be of rare occurrence. Should the above remedy not be thought expedient, an entry on the patent issued that it was deemed an infringement, or was destitute of novelty, would, it is believed, go far to check improper issues, and caution the public against imposition. It has been supposed if a small part of the money received from patents was appropriated for the publication of all specifications of patents, or at least the claims under the specification, and the distribution of the same in different States, the money would be well spent. The public would then know what patents were issued, and be able to guard against spurious ones. Copies could also be easily procured without sending to the patent office, and the publication might be made with so much care as to justify the introduction of the published copies as prima facie evidence in courts of justice.

There is a common error in the assignment of patents; partial assignments for States, counties or towns, are not recognised by law; and still such a large amount of property is now held, in this manner, that it deserves consideration whether some provision should not be introduced to remedy the evil in future, and to protect past assignments. Few patentees seem to understand the law of assignment; the present law authorizes an assignment of the whole patent, or any individual part of the same, as one-half, one-third, one-fourth, &c. But the assignee must stand in the place of the original inventor, both as to right and responsibility. In the United States courts, where a plaintiff averred himself the assignee of the original inventor, with the exception of three counties in one State, a non-suit was ordered, because the plaintiff, by his own showing, proved himself not to hold any legal right under the assignment. It is respectfully suggested, whether the time allowed for recording patents should not be limited. The same reasons for a limitation applies to transfers of patents as to transfers of real estate. It has been before remarked that the fee of thirty dollars is paid into the treasury. It often happens that this is the first step taken by the patentees. A farther examination satisfies the applicant that his patent could not be sustained, and he, of course, seeks to recover his money.—This, however, having passed into the treasury, cannot be paid without an application to congress; the sum is a small one; too much to lose, and yet hardly worth the trouble and expense of recovery.

Applicants often forward the thirty dollars directly to the superintendent, supposing that he is authorized to receive the money. As he is not permitted to do this, it becomes necessary for him to return the money, however distant, for the applicant himself to pay into the treasury. It is suggested whether the head of the patent bu-

reau could not, (by giving bonds, if required,) receive and pay over this money directly into the treasury, and save the hazard and delay of remitting it to the patentee; and it is also suggested, whether there would be any danger in authorizing the treasury to repay such patent fees as should have been received into the treasury through mistake or ignorance, upon a petition approved by the superintendent of the patent office. In answer to the inquiry, what additional room is needed for the patent office, I would observe, that the building in which the patent office is now kept, was finished for the joint use of the post office and patent office. It is evidently too small for both. The post office department needs the whole building, while the rooms allowed to the patent office are entirely too small; the model rooms are full; several hundred models are stored away in the garret.—Those now received are piled up, waiting for better accommodations, and what shall be done with the thousand models to be received annually? While it becomes necessary to procure more room for the patent office, it is desirable that some should be rendered as secure as possible from fire. The destruction of the present models and records would produce very great embarrassment, especially as so many original patents and assignments are lost. It is a satisfaction to state that the patent office has not been, and need not be, onerous to the government. There now remains in the treasury about \$150,000 to the credit of the patent office, after paying all expenses since its first organization. A part of this sum would furnish a commodious and permanent building: and should all the patents be so arranged, in systematic order, to show the progress of the arts in the country, it would be an exhibition highly gratifying, as well as instructive. The present limited room prevents such an arrangement. In answer to inquiry, what additional expense would be incurred by an exhibition of the models of machinery, and specimens of fabrics and other manufactures and works of art not patented? I reply, that the keeper of the models in the patent office could superintend this exhibition without any extra charge, and when rooms were constructing for patented models, additional rooms could be made for the reception of fabrics and models unpatented, with little expense.

It is believed that there are many inventors who would delight to exhibit their improvements in machinery and manufactures, if room was allowed them, while they do not desire to take out a patent; such a collection and exhibition would be a repository of national ingenuity, and might be made highly honorable to the country. Who could fail to be instructed by such an exhibition? And who that was about to invest in machinery, would not be amply compensated by visiting the patent office. The exclusion of foreigners from the benefits of the patent law cannot fail to be noticed as an exception to that reciprocity which this government has ever cherished. Citizens of the United States are daily taking out patents in France and

England, and the subjects of those countries are greatly disappointed in being refused a similar privilege here. Congress has sanctioned the principle of granting patents to foreigners who apply to that body. Should foreigners be permitted to take out patents, and pay fees corresponding to those demanded of our citizens in their countries, it would not be inequitable. The following table will show the comparative charges in several countries for patents:

In Great Britain, or England, and colonies	122£	\$542 21
Scotland	19	84 16
Spain	60 16s.	299 97
Ireland	137	607 77
France	46 10	206 66
Austria	43 06	196 68
United States of America	6 10	30 00

It would be desirable that all foreigners should be allowed to take out patents for a fixed sum, (perhaps one hundred dollars,) since it would be difficult in some cases to ascertain what the particular country to which the patentee might belong charged for the same. By the present law, foreigners residing here two years are allowed to take out patents on the same terms as citizens. There is an evident propriety in granting patents to those who declare their intention of becoming citizens. Why visitors for two years should enjoy any privileges over other foreigners does not readily appear. I now proceed to answer more definitely the remaining inquiry. How many persons are necessary for the prompt and efficient performance of all the duties connected with the office, and what should be the respective and particular duties.—Under the present organization two additional clerks are absolutely necessary.—This would give the following force: one superintendent, three clerks, one examiner, one draughtsman, one machinist, one messenger.

The duties might be distributed as follows:

The superintendent to conduct the correspondence; issue the papers for patents; and exercise a general supervision. Chief clerk to keep the accounts; compare records and transfers; index caveats; file the applications for patents, and transmit the same; and aid, if required, in the correspondence. Second clerk to transcribe on parchment the specifications. Third clerk to aid in transcribing specifications; and filling up patents, and recording the same; and recording letters. An examiner, who should compare, critically, every specification, drawing and model; ascertain its interference with pending applications. The duty will be very arduous, some specifications containing ten or twelve pages of closely written matter, with many references to drawings. In this duty the examiner might be assisted by a scientific draughtsman, whose labor in drawing could only occupy part of his time. A machinist is necessary to repair the models and keep them in order; to classify and arrange them; to exhibit them to strangers;

and to answer the many inquiries made respecting them by patentees and visitors.—The models are of much value, and the large rooms should have at least one person in attendance to protect the property. A few models have already been injured by visitors. What effect the new organization might have in reducing the number of patents cannot be determined. Some present duties would doubtless be lessened by the proposed alterations; others would arise; applications would require a very strict scrutiny to detect interferences with prior patents, or a want of novelty. To avoid the embarrassment from the delay in furnishing copies where the pay is specific, it is most respectfully submitted, whether it would not be advisable to authorize the head of the patent bureau to employ (if necessary) occasional assistance in transcribing said copies, reimbursing the whole expense from the fees received. This discretionary power would dispense with the appointment of another permanent clerk, and meet the sudden exigencies as they arise, without suspending the ordinary business of the office. I have omitted to mention that a few hundred dollars will be required to procure suitable tools for the machinist to repair the models.

I am, most respectfully, yours,

HENRY L. ELLSWORTH.

Hon. SECRETARY OF STATE.

APPLICATIONS OF CHEMISTRY TO THE USEFUL ARTS, BEING THE SUBSTANCE OF A COURSE OF LECTURES DELIVERED IN COLUMBIA COLLEGE, NEW-YORK, BY JAMES RENWICK, PROFESSOR OF NATURAL EXPERIMENTAL PHILOSOPHY AND CHEMISTRY.

V.

CARBON, HYDROGEN AND THEIR COMPOUNDS.

4. MANUFACTURE OF COKE.

AUTHORITIES.—KARSTEN. *Metallurgie de Fer.*
DUMAS. *Chimie appliquée aux Arts.*
BEAUMONT and DUFRENOY. *Voyage Metallurgique.*

Rationale.—Coke bears the same relation to bituminous coal, which charcoal does to wood, and is, like it, obtained by distillation at a red heat. Bituminous coal is a compound of carbon, hydrogen, and oxygen, in very various proportions. In the variety called cannel coal, the proportion of hydrogen amounts to $5\frac{1}{2}$ per cent. in the Liverpool coal it is about $3\frac{1}{2}$ per cent., and in the slaty varieties does not exceed one per cent. The quantity of carbon varies from 75 per cent. in cannel coal, to 90 per cent. in that of Newcastle. The proportion of oxygen in cannel coal is about twice as great as would suffice to convert the hydrogen into water; in the Newcastle coal about four times as great; and in the slaty varieties, it but little exceeds the proper relation.

Coals may be divided into three varieties:

1. Those which contain at least three per cent. of hydrogen, and, at most, as much oxygen as will convert half the hydrogen into water.

2. Coals which contain oxygen in such

quantity as to convert two-thirds of the hydrogen into water.

3. Coals which contain oxygen enough to convert the whole of the hydrogen into water.

The first of these varieties fuses when heated, and the excess of hydrogen uniting with a part of the carbon, escapes in the gaseous form; by the formation and escape of gas, the coke is rendered light and porous. The second variety fuses also, but the quantity of gas formed is not sufficient to render the coke porous, it is therefore compact and massive.

The third variety does not fuse, and the escape of the vapor of water reduces the mass to the form of powder.

Coal of the first class increases in volume when it is coked; the other two varieties yield coke in less volume than the coal employed. In their uses in the arts, the first furnishes the most valuable coke; the last that of least value.

Coke may be prepared in iron cylinders or retorts, but this is only done when the volatile products are to be collected; this method will therefore be described when we treat of the preparation of gas for illumination. Treated in this way, cannel coal yields about 50 per cent. of coke, and that of Newcastle as much as 80 per cent.

When the distillation is performed at a low temperature, the weight of coke is increased, but its volume and porosity are diminished. It is therefore advantageous, when the volatile matters are not the principal object, to effect the decomposition of the coal by a sudden and high heat.

Preparation.—When coal is rich in hydrogen, it may be readily coked in heaps resembling the *pits* used in preparing charcoal. The coal must be in pieces having not less than three or four inches in each dimension. The heaps are conical, having a base 15 feet in diameter, and a height of about 30 inches. The heap may be best covered with straw, on which is laid a layer of moist earth, the straw being so applied that the earth cannot enter into the spaces between the pieces of coal. But as the use of straw is expensive, it is more usual to cover the large coal for about the height of a foot from the ground with smaller pieces, and the outside with coal-dust; the top of the heap is covered with the refuse coke which is left in the form of powder, in handling that obtained in previous operations. The heap being finished, a few lighted coals are dropped into an opening of six or eight inches in depth left in the top; the space is then filled up with fragments of coal, and when the combustion has fairly commenced, the whole is covered with earth or refuse coke. The rest of the process is much the same as that of preparing charcoal, but is easier, as coal when in mass will not continue to burn after the gaseous matter has escaped, unless new surfaces be exposed to air.

In heaps of greater diameter and height than we have described, the combustion would be too slow at first to form a porous coke, and so rapid at the end as to render it difficult to extinguish. Yet so large is the quantity of coke which is required in some instances, and particularly in the

manufacture of iron, that heaps of so small a size would be attended with inconvenience. The shape of the heap is therefore changed in such cases from a cone to a long prism. The breadth of this must not exceed 15 feet, nor its height 3 feet, but its length may be unlimited. This prism must be set on fire in the mode we have mentioned at several points on its upper edge. In this way not only may a greater quantity of coke be prepared at a single operation, but the time is shortened, the conical heaps requiring three or four days for their conversion into coke, while the prisms are finished in 24 hours.

The product is usually about 40 per cent., but some coals, that of Virginia for instance, yield 50 per cent. If a coal, in consequence of its containing but little hydrogen, does not burn freely, it cannot be converted into coke in this way. Such a coal was found in Yorkshire, (England,) in association with minerals which would render the manufacture of iron profitable. In order to apply it to this purpose, an intelligent manufacturer (Wilkinson) imagined the application of a chimney, for the purpose of obtaining a more powerful draught. This chimney is conical in form, about a yard in height, and as much diameter at bottom; the diameter at top is two feet; it is built of brick, the lower courses of which are laid in such manner as to leave openings. Around this chimney the coal is piled in a heap, whose radius is about 6 feet greater than the outer radius of the chimney. This heap is composed of alternate layers of large and small coal, the lowermost layer being of pieces of the largest size. The surface of the heap is covered with ashes or refuse coke, and fire is applied by throwing burning fuel into the chimney. Wet ashes are kept on hand to close any cracks which may occur in the cover of the heap. Dense smoke flows from the chimney, and is followed by a blue flame; as soon as this appears, the top of the chimney must be closed by a plate of cast iron and the combustion will speedily cease.

The coal of Pittsburgh, Pa., as far as we can learn, must resemble in quality the coal employed by Wilkinson, for although far removed in character from anthracite, it has not hitherto been converted into coke by the use of the mode first described. We cannot but express our belief that the method of Wilkinson would be found sufficient for the purpose and that by its aid the manufacture of iron from the ores might be introduced into that city, which at present receives almost all the pig iron used in its extensive foundries and forges, from the opposite side of the Alleghany range of mountains.

This method has also been introduced, with some modifications in Staffordshire, where the coal is of better quality. Here the coarser coal is placed in contact with the chimney, and the finer at the outside of the heap, the whole being covered with ashes or refuse coke, leaving a few openings for the admission of air. As soon as the coke is finished, water is poured on the heap to extinguish the combustion. In

this way the product of coke is raised from 40 to 50 per cent.

All the methods of which we have spoken require that the coal should be principally of that size which is of most value for other purposes, namely in coarse fragments. Much however of all good coal is reduced to dust in its extraction from the mines, and in the handling it must undergo. This, in most parts of England, is totally lost, and it has even been necessary to burn it in heaps in order to get rid of it.—In France, where coal is more scarce, and consequently of more value, it has become an important object, that none but such refuse coal should be converted into coke, and the coarser pieces left to be employed for other purposes. This object has been successfully accomplished in the neighborhood of St. Etienne.

The heap in which the coal is burnt may have the form either of a truncated cone or oblong truncated pyramid. The latter form is the most easily constructed, and described. A case of plank is formed, having the desired figure, say a base of 50 or 60 feet in length by 4 feet in breadth, a height of 3½ feet; and the planks are so inclined as to make the dimensions of the upper surface two feet less in each direction than that of the base.

The planks which form the ends of the case are each pierced with four holes: one at the base, one directly over it and near the top, the other two at half the height of the plank, and in the vertical plane of the upper edge of the sides. Each side is also pierced with three ranges of holes, having the same arrangement in quincunx as those of the ends, and at the same distances.

These holes serve for the introduction of tapering spars. The spars of the lowermost layer are passed through the holes in the sides and ends, at right angles to the respective direction of these surfaces, and at the angles where the spars meet each other, vertical spars are set up. The second range of spars is inclined to the sides in such manner as to meet the vertical spars; and the third layer has the same direction as the first.

The fine coal is prepared by mixing it into a paste with water, by means of a hoe. It is then thrown into the case, and well rammed upon the lower range of spars, until a bed has been formed to receive the second range of spars. This latter range being placed, more coal is thrown in and rammed, until the height of the third range of spars has been reached, and this being introduced, the rest of the case is filled in the same manner.

In order to lessen the expense of the wood employed, the heap may be built in successive portions, each ten or twelve feet in length, and when one portion has been finished, the planks and spars are removed to enclose and form passages in a second portion. The spars form conical passages in the mass, by which air may be admitted during the combustion. When the heap has thus been completed and covered with ashes and refuse coke, all the wood is removed, and the heap is set on fire by igniting small heaps of

coarse coal upon each of the openings left in the upper surface by withdrawing the vertical spars. It has been found that in pyramidal heaps, about $\frac{1}{20}$ part of the coal to be coked is required for this purpose; but in small conical heaps, where a single vertical spar will suffice no more than $\frac{1}{10}$ will be used.

The attention of the workmen must be directed not only to close the cracks which may appear in the cover, but to keep the passages left by the spars open by means of iron rods. The completion of the process is known by the cessation of the flame. Water is then introduced into the lower passages, whose steam in passing through the incandescent heap is decomposed, and furnishes hydrogen which escapes in flame. The heap is then covered closely with earth, and left until it cools.

In this way coal which would otherwise be lost, yields 50 per cent. of coke of excellent quality.

When coal of the first variety (with the exception of cannel coal) is distilled in close vessels it yields from 70 to 80 per cent. of coke, by the combustion of about ten per cent. of coal. As the best of the methods we have yet described yields no more than 50 per cent., and the most common of them no more than 40, there is obviously a very great waste. In the neighborhood of coal mines this is more than compensated by the simplicity and facility of this process. But at a distance from mines a more economic process is necessary, unless coke can be transported from this vicinity, which is by no means easy, in consequence of its friable character, and its being liable to injury by being wet. The best apparatus for this purpose is called the coking oven. This is formed of a cylindrical wall about 2 feet in height surmounted by a dome, from the summit of which rises a chimney about 18 inches in height. In the circular wall is a door about 18 inches by 12 inches, having an iron shutter. The coal is introduced through the chimney, and spread by a rake over the floor, to an uniform depth of about 4 inches. Burning coals are then dropped through the chimney, and as soon as the ignition is fairly commenced the door is closed. When a blue flame begins to appear at the chimney, the top of it is closed by a plate of iron. In this method about one half more coke is obtained than by the ordinary heaps.

Large spheroidal kilns, and reverberatory furnaces have also been used, but their principal object was the preparation of the coal tar. As this article has not proved to be of any great value, and is besides produced at gas-works in quantities greater than can be consumed, it is unnecessary to describe these kilns and furnaces.

It may be here mentioned that turf or peat may be carbonised as well as coal or wood. The fuel thus produced is of very excellent quality, and may be applied to the same purposes as that obtained from wood or bituminous coal.—

Pits as used in preparing charcoal have not been found well adapted to the preparation of the charcoal of turf. The little that has been made of good quality was prepared in iron cylinders, but as this is too expensive for manufacturing purposes, it appears probable that if it should ever be necessary to carbonise turf on a large scale it will be done in kilns like those described under the head of charcoal.

5. LAMP-BLACK.

AUTHORITY.—Encyclopedie Methodique.—Arts et Metiers.

Lamp-black derives its name from its having been originally obtained by collecting the soot of lamps. This method is still used in some cases. Linen wicks are immersed in linseed oil and lighted; the smoke is received in a copper vessel on which the soot is deposited. What is called ivory black was made at first by receiving the smoke of similar wicks upon plates of ivory.

At present lamp-black is manufactured on a large scale, by burning refuse resinous substances, or even from the soot of coal. When resinous matters are employed, they are placed in a kettle over a furnace, and free access of air is admitted over the mouth of the kettle. The resinous matter being heated fuses at first and finally takes fire, giving out a dense smoke. This smoke instead of being carried off by a chimney, enters a lofty circular chamber; the roof of which is conical with a single opening in the centre. From this roof a cone of sheet iron is suspended by a pulley, and nearly fills up the area of the chamber; this cone has also an opening in the centre. The interior of the chamber, and the lower surface of this cone are covered with coarse woollen cloth or with sheep skins. Upon these the soot settles, and may, when the combustion is over, be separated by drawing the sheet iron cone up and down by means of the pulley.

Lamp-black is extensively used as a paint, and there are other forms of vegetable charcoal which are applied to the same purpose. Even common charcoal reduced to powder is sometimes so employed.

Blue black is formed by burning the kernels of the peach in crucibles, to which the covers are carefully luted, with but one opening for the escape of the gas.

A very fine black is made by treating the twigs and tendrils of the vine in the same manner. The article called black chalk, and used in the manufacture of crayons, or for drawing, without preparation is the charcoal of a shrub (*fusain*) which grows in France.

The black used in Europe by engravers is made from a mixture of wine-lees, peach-pits, ivory and bone, calcined and ground to powder. It is prepared for use by making it into a paste with linseed oil.

6. ANIMAL CHARCOAL.

AUTHORITY.—DUMAS, Chimie appliquee aux Arts.

History.—In the preceding section we

have mentioned the original mode in which ivory-black was prepared. For that method, the calcination of fragments of ivory in close vessels was substituted, and it was speedily found that an article little inferior was to be obtained from bones. Still, so long as the sole use to which either was applicable was in the art of painting, this observation was of little value. At the end of the last century, however, it was discovered that carbon, in any form, had the property of discharging the colors, taste and smell of liquid vegetable substances. Common charcoal was at first used for this purpose, but in 1811 it was discovered by a chemist in the south of France, that animal charcoal was much more powerful in its effects, and was capable of separating rapidly and certainly, vegetable coloring matter from any liquids whatsoever. Since that time the manufacture of animal charcoal has risen to great importance, and we shall hereafter have occasion to cite several important applications that have been made of it in the arts.

Preparation.—Animal charcoal is usually prepared from bones, and at the same time ammonia is obtained. We have had occasion to refer to this process under the head of that alkali. Some farther details are, however, necessary. The carbonisation of bones is performed in cast iron cylinders, similar to those used in the manufacture of nitric and muriatic acids. The tube which conveys off the volatile matter must be three inches in diameter, and connected with a series of three necked bottles.—The opposite end of the cylinder to that where the tube issues is closed by a dish, which has no opening in it. The bones are broken to pieces and freed from the fat by boiling. They are placed in the cylinders and kept at a red heat for thirty-six hours; at the end of this time they are taken out, and shut up in close vessels to prevent combustion, until the charcoal is cold. The charcoal is then stamped into coarse powder, and finally ground between mill-stones into fine meal.

If it is to be used as a paint, it is again ground with water, and then dried in earthen moulds. Another form of animal charcoal which was formerly lost, is that left in the preparation of Prussian blue. In this manufacture blood is calcined with potash, and the charcoal is obtained by washing off the alkali.

APPLICATION OF ANIMAL CHARCOAL TO THE DISCHARGE OF VEGETABLE COLORS.

The action of charcoal in discharging colors seems to be owing to the same cause as its power of condensing gasses; of one of which it takes up 90 times its own bulk. The action in this case is due to a mechanical attraction, and to this we may ascribe its powers of retaining the coloring matter of liquids filtered through it. Animal charcoal, upon this theory, owes its superior effect to its greater degree of division; this minute separation of its parts is evident from the fact, that the actual carbonaceous matter in calcined bones does not exceed ten per cent. and is yet sufficient to give its intense black color to the remaining mass

of phosphate and carbonate of lime. In that obtained in the manufacture of Prussian blue the division is still more minute, as it is in fact a chemical precipitate from the blood employed, it has for this reason a still more powerful effect. In consequence of this divisibility a larger surface is provided by which the attraction may be exerted.

The liquids which best evince the powers of charcoal in discharging colors, are the solution of indigo in sulphuric acid and molasses. The relative powers of different forms of charcoal on these solutions are exhibited in the following table, the power of that obtained from bones, without further preparation being taken as the unit.

	Indigo.	Molasses.
1. Calcined bones,	1.00	1.00
2. Soot of vegetable oil fused with artificial phosphate of lime,	2.00	1.90
3. Calcined bones from which the phosphate of lime has been washed by muriatic acid,	1.87	1.60
4. Calcined bones again calcined with potash,	45.00	20.00
5. Albumen or Geatine calcined with potash,	35.00	15.50
6. Blood calcined with potash,	50.00	20.00

In order to render the above table useful it is to be stated that a given quantity of calcined bones will discolor the solution of one thousandth part of its weight of indigo, or nine times its weight of molasses. After producing this effect it will not act again until the coloring matter absorbed has been separated by calcining the charcoal a second time.

As an instance of the use of these substances in the arts, we may cite an article well known in our markets. The made wine, called Marseilles Madeira, is prepared from the common red wines of the south of France. Their deep color is discharged by filtering them through animal charcoal, and they are made up to the American palate by the addition of brandy. The peculiar smell and taste of the original wine is discharged at the same, and it is thus ready to receive such as may be given it artificially.

Animal has similar advantages over common charcoal in the rectification of spirituous liquors. By its use, all the peculiar and often offensive taste and smell of these liquors may be separated. We shall have occasion to treat of these uses of charcoal under their proper heads.

A carbonaceous substance, having powers in these respects about equal to calcined bones, has been prepared from a species of shale charged with bitumen, which is found in some geological formations, and particularly in the strata of coal fields. In the separation of the volatile matter the shale becomes extremely porous. It is therefore well adapted to the construction of filters, which may be made of slabs of the carbonised rock.

7. GAS-LIGHT.

Rationale.—Bodies which burn with

flame must be either volatile, or capable of furnishing a gas when heated. Thus, phosphorous and sulphur burst into flame, when their vapor escapes freely, and the vapor of alcohol is readily ignited. Any aeriform body whatsoever, if intensely heated, assumes the appearance of flame. In oleaginous, resinous, and bituminous substances, a red heat causes a decomposition, and new combination of their elements; these new combinations are both gaseous and volatile, are readily ignited, and in burning form flame. Thus in a common fire of bituminous coal, bitumen is first formed; this is again decomposed by the heat, yielding tar and gaseous carburets of hydrogen; the former yields vapor, which in mixture with the gas burns with flame. In a common lamp or candle, the wick composed of inflammable matter readily takes fire; the heat thus produced melts the tallow, when that is used; the liquid tallow, or oil, is drawn up by capillary attraction into the pores of the wick, and coming in contact with its ignited part, is decomposed and yields carburetted hydrogen; this is set on fire by the ignited wick, and flame is formed.

Gases do not become luminous, nor assume the appearance of flame, except at very high temperatures, far higher, indeed, than those at which solid bodies become luminous. If then, a gas, when heated in the act of combining with oxygen, so far as to become luminous, should deposit a solid body, or if the product of the combustion should have the solid form, the flame will be brilliant; but if the product of the combustion remain in the state of gas or vapor, the flame will give but little light.

Thus, when phosphorus is burnt, the whole product is solid, and the flame has the greatest brilliancy of any that is known; when heavy carburetted hydrogen, (olefiant gas) burns, a part of its carbon is deposited, which, disseminated through the flame in a solid form, gives it the lustre due to an intensely heated solid; but when hydrogen or alcohol are burnt, even by the aid of a stream of oxygen, which causes the greatest heat of any known combustion, the flame will have so little brilliancy as to be hardly visible in the bright light of day, because the products are aqueous vapor and carbonic acid gas.

Combustible bodies may not only be decomposed directly in a fire, or by the aid of wicks, but they may be heated in close vessels, and the gases which are evolved may be kept in proper reservoirs until needed for the purpose of illumination.—From these vessels they may be carried in pipes to the place where the light is needed, and inflamed by an ignited substance as they issue from beaks of some convenient form.

When combustible bodies, whose principal constituents are carbon and hydrogen, are decomposed by heat, these elements may be either wholly separated or may enter into new combining. The products are therefore carbon in the solid form which remains in the apparatus where the decomposition is performed; hydrogen uncombined; light carburetted hydrogen, olefiant gas or heavy carburetted hydrogen;

liquid carburets of hydrogen; and tar. In the present case the residuum of carbon need not be spoken of, nor would we have any thing to add to what has been stated under the heads of Coke, and the several varieties of charcoal. Hydrogen has the smallest density of all known bodies, and in burning produces the most intense heat; but as the product of its combustion is aqueous vapor, and that extremely rare in consequence of being generated at a very elevated temperature, the flame has so little brilliancy as to be hardly visible in the light of the sun. Light carburetted hydrogen is a compound of one equivalent of carbon to two of hydrogen. The density of the compound is increased to eight times that of hydrogen, or the numbers which respectively represent these specific gravities are 1 and 8. In a close vessel it is not affected by a heat below one approaching to whiteness; but at a white heat or a little below, it is decomposed, and deposits its carbon. When burning freely, sufficient heat is generated to produce this decomposition, and the carbon deposited in the flame having the solid form, and therefore becoming more luminous than the hydrogen or the aqueous vapour which that gas forms, gives brilliancy to the flame. Light carburetted hydrogen is not absorbed by water to any appreciable extent.

Olefiant gas contains twice as much carbon as light carburetted hydrogen, and may be considered as a combination of one equivalent of each of its constituents; the volume of the hydrogen is reduced one half, and the density of the compound is fourteen. Even at a low red heat, olefiant gas begins to decompose, depositing half its carbon, and being thus converted into light carburetted hydrogen whose density is lessened in the relation of 8 to 14. At a full red heat it is completely decomposed. In burning therefore it deposits twice as much carbon from an equal weight of gas, furnishes a flame of equal size to that of twice its bulk of hydrogen, and which is far more brilliant, in consequence of the quantity of carbon deposited in the flame being twice as great. Olefiant gas is therefore the most valuable of those generated by the decomposition of combustible bodies, and in the manufacture of them every exertion should be made to obtain it in the greatest quantities, which the nature of the material will admit, and to preserve it from waste after it is formed. The most obvious cause of waste is its having a greater degree of solubility in water, than the light carburetted hydrogen or pure hydrogen; water taking up one eighth of its own bulk.

Two liquid carburets of hydrogen were discovered by Faraday to exist in gas. These are very volatile, one of them boiling at 60 Fahr. and the other as low as the freezing point. Both of these may therefore exist in vapor at mean temperatures, and the latter under almost all circumstances. They both contain more carbon than olefiant gas, and therefore furnish a flame of greater brilliancy, but it may happen that all the carbon they deposit is not consumed, and thus, too great

a proportion of them may take the form of smoke.

The vapors of these carburets agree with olefiant gas in one property, viz., they are decomposed by chlorine, rapidly and without the aid of light, while hydrogen, and light carburetted hydrogen, are condensed by it more slowly. As these vapors and olefiant gas are more valuable for illumination, the measure of the quantity of a given mixture which is condensed on the first application of chlorine is the best of all tests for the value of gas intended for illumination.

Another liquid carburet, analogous to Naptha is likewise produced in the decomposition of coal. As this does not boil below 180°, but little of its vapor can be present at ordinary temperatures; but if present it produces a dense smoke, except in burners of the best form.

The tar need only be mentioned here in consequence of its being capable of decomposition by being returned to the apparatus, and thus of yielding the gaseous and volatile compounds just spoken of. In the laboratory, or under circumstances where the heat may be carefully regulated, the character of the products may be varied to a very great extent. From bituminous substances little else but tar may be obtained, and oleaginous substances will yield little but their own vapor, if the apparatus be not permitted to become red hot. If allowed to rise to a low red heat, olefiant gas, and the two volatile carburets will become the principal products; at a higher heat light carburetted hydrogen; and at a white heat uncombined hydrogen. In the successive stages of the process, the several substances will come over mixed in various proportions, and each in its turn will cease to appear.

In manufactories on the large scale, such nicety is impracticable, nor is it ever necessary. It is then sufficient to divide the matters which are used into two classes, each of which requires a peculiar management.

The first class comprizes those substances which do not decompose rapidly until the light carburetted hydrogen is formed. These must be subjected to a full red heat; for an attempt to obtain the more valuable compounds would be attended both with delay and a waste of the material. Still as some olefiant gas will be formed, no more water should be used in purifying them than is absolutely necessary to remove offensive matter. Coal is a body of this class.

The second class comprizes those which may be decomposed with sufficient rapidity, at a temperature consistent with the existence of olefiant gas. These ought to be treated at the lowest temperature which will ensure the decomposition of their own vapor; one which merely gives a red glow to the surface of the iron vessel used in the process is sufficient for the purpose. To this class belong oils, and the solution of rosin in spirits or turpentine.

History.—The adaptation of a wick to oil or tallow, in order to obtain light by the decomposition of these substances, and

the ignition of the gases and vapors they yield is among the oldest of human inventions. On the old continent neither tradition, written history, nor even mythological fable reach the epoch of its discovery. Yet it must have been introduced prior to the separation of the races which peopled the two continents; for while in the ancient world there is no tribe so rude and savage as not to be acquainted with the use of the lamp, even the polished nations which occupied Mexico and Peru were ignorant of it. The only inhabitants of the Western hemisphere who used wicks were the Esquimaux, and if they be an ancient American race, they may have derived this information from Greenland, which was peopled at a remote era by a Norwegian colony.

The idea of separating the two processes which take place in the wick, effecting the decomposition at one time, and storing up the gases for use did not appear to have occurred to any one until the year 1785, when it was proposed by a French engineer of the name of Lebon. This was applied to the distillation of wood, and he endeavored to collect at the same time the pyrolignous acid which was evolved. It does not appear that this use of his invention was attended with any valuable result. In this country, however, about 30 years ago, the apparatus of Lebon was manufactured in Baltimore, and occasionally used for the distillation of bituminous coal. The retort employed was of the shape of a flower pot and made of iron; to this a cover was fitted by grinding, whence a pipe proceeded; and the pipe was usually divided into two branches each of which terminated in a burner. The retort being filled with coal was set in a common fire, and the gas ignited when it began to escape from the burner. In order to prevent the offensive smell of the gas from being apparent, the lights were kept beneath the chimney.

Previous to the year 1806 the factories of Watt and Bolton at Birmingham, and of Philips and Lea at Manchester were lighted by gas obtained from coal; and in the ten years succeeding, it was generally introduced into all the large manufactories of Great Britain. It was also occasionally used in smaller establishments, and in particular at Ackerman's in London, whose example had a powerful influence in bringing it into public notice. When first applied, no attempt was made to purify the gas, its use was therefore extremely offensive, and by no means wholesome. During the ten years of which we have spoken the character of the gases evolved in the decomposition of coal were chemically examined, and by the aid of science, the mode of separating every offensive substance, and most of those injurious to combustion discovered.

In 1815, some streets in London were lighted by coal gas distributed in pipes, and in 1816 the method became general in that city.

In 1817, Taylor and Martineau began the decomposition of oil, which, when properly treated, yields a gas of far greater illuminating power than is given by coal.

Previous to this time Mr. David Gordon, a gentleman for many years a resident of the United States, had proposed to render gas portable by condensing a number of atmospheres in strong metallic vessels. So long as no gas but that from coal could be obtained the method promised but little success. On the introduction of oil gas however, the plan was resumed and carried into successful operation. By this method, ships, steamboats, railroad and other carriages may be furnished with the beautiful and safe light given by oil gas; and if it was compelled to give way before the immense capital vested in coal gas manufactures in the British capital, there is little doubt that it might be applied to advantage in a new and open field; particularly in countries where coal bears as high a price as it does in most of our Atlantic cities.

The manufacture of gas from rosin as now usually conducted, was the invention of Professor Daniell of King's College, London. It has, however, been conducted on a large scale no where except in the city of New-York. Mr. Rembrandt Peale was however, probably the first who prepared gas from this material, although he treated it in a different manner. The Museum in Philadelphia was lighted under his direction by gas prepared from rosin as long ago as 1814.

a. Coal Gas.

Rationale.—Bituminous coal is composed of carbon and hydrogen in variable proportions. It also contains sulphuret of iron, and according to some, oxygen and nitrogen. We are, however, rather inclined to ascribe the presence of the former partly to the water mechanically combined with the coal, and partly to atmospheric air which cannot be entirely excluded. The latter may also be accounted for, at least in part, by the presence of atmospheric air.

When bituminous coal is distilled at a red heat its elements enter new combinations, the greatest number of which are volatile, although the carbon which is left is greatest in quantity. The volatile products are partly gaseous and partly condensible. The condensible products are:

1. Water, arising from the moisture of the coal, or a new combination of its elements;

2. An oil of the character of Naptha;

3. Tar;

4. Sulphuret of carbon.

The gaseous products are:

1. Hydrogen, Light Carburetted Hydrogen, and olefiant gas, being new combinations of the elements of the coal;

2. Carbonic oxide, arising from the

3. Carbonic acid, combustion of the carbon of the coal in the atmospheric air which cannot be excluded;

4. Sulphuretted hydrogen, formed by an union of the sulphur of the sulphuret of iron with a part of the hydrogen of the coal;

5. Sulphurous acid formed by the sulphur of the sulphuret and atmospheric air;

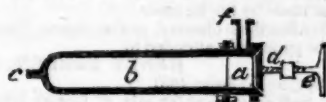
6. Ammonia; the nitrogen of the air combined with hydrogen from the coal;

7. Nitrogen.

Of the condensible products so much of the oil as can be retained in the state of

vapor is advantageous in the combustion, but is apt to be inconvenient and may be dangerous when it condenses in the pipes and burners. The sulphuret of carbon is luckily in small quantities, as it is condensible with difficulty. Of the gases; hydrogen and the carburets of hydrogen are the useful substances for illumination; carbonic oxide burns with a flame of little brilliancy, and is not injurious, although of little value. Carbonic and sulphurous acids, and ammonia do not burn; being also destructive of combustion they would lessen the heat, and therefore impair the brilliancy of the flame. Sulphuretted hydrogen burns, but has a most disagreeable smell, as have also sulphurous acid and ammonia. It is obvious therefore, that the vapors ought to be condensed, and all the gases except the hydrogen, its carburets, and the carbonic oxide separated.—Cooling in a proper refrigerator will effect the first object, and the condensed water will retain the ammonia, with some of the sulphurous acid and sulphuretted hydrogen. Lime has so great an affinity for carbonic acid that it may be employed to separate it, and the residue of the sulphurous acid and sulphuretted hydrogen, being soluble in water might be condensed by washing in that liquid, were it not for the loss thus caused of olefiant gas. In the course of practice it was however, discovered that lime has an attraction for sulphuretted hydrogen, and that its affinity for sulphurous acid is sufficient to cause that gas to be retained. The process of washing is therefore no longer considered absolutely necessary.

Manufacture.—Those coals which, in treating of coke, were arranged in the first class, are alone fit for the preparation of gas. Of these, cannel coal furnishes the largest quantity, and its product is richest in the most valuable gas, the olefiant. Any coal of this class, however, which can be obtained at a low price will answer the purpose. The decomposition was originally effected in retorts, but is best performed in cylinders of cast iron. As it has been found that the front of the retorts resisted the fire for the longest time, and that the opposite end might be burnt away, while the first remained perfect, they are now usually formed of two pieces. These are united by screw-bolts, and their joint rendered tight by a cement formed of iron-filings sulphur and muriate of ammonia. The front of the cylinder is slightly beveled, in order to receive an iron stopper.—This is held in its place by a screw adapted to the middle of an iron bar, which is fastened over the stopper. The pipe by which the volatile matter escapes, proceeds from the top of the cylinder near the stopper. Such a retort is represented in fig. 1.



- a, Anterior portion of the retort;
- b, Posterior do. do.;
- c, Projection, built into the wall of the furnace;
- d, Stopper;
- e, Screw;

f, Pipe which carries off the gas.

Five such cylinders are usually arranged in one furnace, and the number of furnaces increased with the quantity of gas needed. The several furnaces communicate with a single large chimney, usually of a conical shape; and in some of the best establishments, a separate flue is carried up from each furnace, for a short distance within this cone.

In order to exclude atmospheric air, when any of the retorts are opened for charging and cleansing, and to prevent the reflux of the gas into the retorts where the decomposition is complete, the tubes which convey the gas are bent down into a common receiver, usually of a cylindrical shape and placed horizontally. This cylinder is about half full of water, into which the several tubes dip, each to the depth of an inch. The bend of the tube must be so high above the surface of this water as to prevent the pressure of the gas from forcing the water over it into the retort.

The condenser is formed of a series of cast iron pipes immersed in a cistern of water, which must be kept cool by constant renewal. The pipes must be laid in a sloping position, or communicate with a sloping pipe, in order that the condensed matter may run along them. At the lowest point in this series, a pipe proceeds downwards to a reservoir which receives the condensed substances. In order to prevent the entrance of air, the end of this pipe must be constantly immersed in water. The reservoir will receive by this pipe the tar, water charged with ammonia, with a part of the oil, and of the sulphuret of carbon.

(Concluded in our next.)

HARTFORD AND NEW-HAVEN RAILROAD.
PROPOSALS will be received from the 22d to the 28th of the present month, at the Engineer Office of the Hartford and New Haven Railroad, (corner of East and Collis streets, New Haven,) for grading the Northern Division of the Railroad from Meriden to Hartford—being a distance of 18 miles. After the 22nd maps and profiles of the different sections will be exhibited at the Engineers Office.

ALEX'R. C. TWINING, Engineer.
New-Haven, Sept. 9. 37—3t

STEPHENSON,
Builder of a superior style of Passenger Cars for Railroads.

No. 264 Elizabeth street, near Bleecker street, New-York.

RAILROAD COMPANIES would do well to examine these Cars; a specimen of which may be seen on that part of the New-York and Harlem Railroad now in operation J25st

NOTICE TO CONTRACTORS.

PROPOSALS will be received at the Engineer's Office, in the city of Lancaster, on Wednesday, the 19th day of October next, for the Excavation, Embankment, Wall, &c., required on twenty-five miles of the Susquehanna Canal, commencing at Kline's run, (three miles below the Columbia Bridge,) and extending along the West side of the Susquehanna river, to the "Maryland State Line."

The work will be ready for examination by Contractors, at any time after the 25th inst., and the Map, Profile and Specification, may be seen at the office, one week previous to the letting.

The unusually heavy character of the work, (which affords excellent winter jobs,) offers great inducements for the assistance of Contractors possessing energy and enterprise.

It is expected that the extension of the Canal to "Tide Water," will be ready for letting about the 1st of December.

No mechanical work to be let at present.

EDWARD F. GAY,

Chief Engineer, S. C.

Lancaster, Sept. 13, 1836. 5t—25
14 square \$4 12

FRAME BRIDGES.

THE subscriber would respectfully inform the public, and particularly Railroad and Bridge Corporations that he will build Frame Bridges, or vend the right to others to build, on Col. Long's Patent, throughout the United States, with few exceptions. The following sub-Agents have been engaged by the undersigned who will also attend to this business, viz.

Horace Childs,	Henniker, N. H.
Alexander McArthur,	Mount Morris, N. Y.
John Mahan,	do do
Thomas H. Cushing,	Dover, N. H.
Ira Blake,	Wakefield, N. H.
Amos Whitmore, Esq.,	Hancock, N. H.
Samuel Herrick,	Springfield, Vermont.
Simeon Herrick,	do do
Capt. Isaac Damon,	Northampton, Mass.
Lyman Kingsly,	do do
Elijah Halbert,	Waterloo, N. Y.
Joseph Hebard,	Dunkirk, N. Y.
Col. Sherman Peck,	Hudson, Ohio.
Andrew E. Turnbull,	Lower Sandusky, Ohio.
William J. Turnbull,	do do
Sabried Dodge, Esq.,	(Civil Engineer,) Ohio.
Booz M. Atherton, Esq.,	New-Philadelphia, Ohio.
Stephen Daniels,	Marietta, Ohio.
John Rodgers,	Louisville, Kentucky.
John Tillson,	St. Francisville, Louisiana.
Capt. John Bottom,	Tonawanda, Penn.
Nehemiah Osborn,	Rochester, N. Y.

Bridges on the above plan are to be seen at the following localities, viz. On the main road leading from Baltimore to Washington, two miles from the former place. Across the Metawaukeag river on the Military road, in Maine. On the National road in Illinois, at sundry points. On the Baltimore and Susquehanna Railroad at three points. On the Hudson and Patterson Railroad, in two places. On the Boston and Worcester Railroad, at several points. On the Boston and Providence Railroad, at sundry points. Across the Connecticut river at Haverhill, N. H. Across the Connecticut river, at Henniker, N. H. Across the Connecticut river, at Milford, N. H. Across the Kennebec river, at Waterville, in the state of Maine. Across the Genesee river, at Mount Morris, New-York, and several other bridges are now in progress. The undersigned has removed to Rochester, Monroe county, New-York, where he will promptly attend to orders in this line of business to any practicable extent in the United States, Maryland excepted.

MOSES LONG.

General Agent of Col. S. H. Long.
Rochester, May 22d, 1836. 19y-1f.

AMES' CELEBRATED SHOVELS, SPADES, &c.

300 dozens Ames' superior back-strap Shovels
150 do do do plain do
150 do do do cast-steel Shovels & Spades
150 do do Gold-mining Shovels
100 do do plated Spades
50 do do socket Shovels and Spades.
Together with Pick Axes, Churn Drills, and Crow Bars (steel pointed,) manufactured from Salisbury refined iron—for sale by the manufacturing agents,
WITHERELL, AMES & CO.
No. 2 Liberty street, New-York.
BACKUS, AMES & CO.
No. 8 State street, Albany

N. B.—Also furnished to order, Shapes of every description, made from Salisbury refined Iron. 4-ytf

JUST PUBLISHED,

THE COMPLETE PRACTICAL FARMER,

BEING a plain and familiar treatise on the Culture of the Soil, the Orchard and the Garden; the rearing, breeding, and management of every description of Live Stock, the diseases to which they are subject, and the remedies; directions for the management of the Dairy; a description of the most useful implements of Husbandry; and every information necessary to the practical agriculturist. Also, an index, by which any subject can be instantly referred to. In three parts; Part 3, on Live Stock, under the immediate supervision of R. H. Budd, Veterinary Surgeon, New-York.

Published by COLLINS, KEES & CO.,
36-37 Wall* 230 Pearl-street.

RAILROAD CAR WHEELS AND BOXES, AND OTHER RAILROAD CASTINGS.

Also, AXLES furnished and fitted to wheels complete at the Jefferson Cotton and Wool Machine Factory and Foundry, Paterson, N. J. All orders addressed to the subscribers at Paterson, or 60 Wall street, New-York, will be promptly attended to.

Also, CAR SPRINGS
Also, Flange Tires, turned complete
R. ROGERS, KETCHUM & GROSVENOR

OFFICE OF THE WETUMPKA AND COOSA R. R. CO. }
WETUMPKA, ALA., 29th July, 1836.

THE Directors of the above Company are desirous of securing the services of a competent resident Engineer, to survey and locate the route of the Wetumpka and Coosa Railroad, commencing at this place. The route of the road will pass through a country that is considered as healthy as any in this latitude. Persons desirous of embarking in such an undertaking will please address the undersigned at this place.

W. H. HOUGHTON,
Sec. W. and C. R. R. Co.

The Evening Star and Courier and Enquirer, New-York; the Commercial Herald, Philadelphia; Baltimore Gazette; National Intelligencer, Washington; Richmond Enquirer and Whig, Richmond, Va.; and Charleston Mercury, will please give the above eight weekly insertions, and send a copy containing the advertisement, together with their bills, to the undersigned. (34-51) W. H. HOUGHTON.

ALBANY EAGLE AIR FURNACE AND MACHINE SHOP.

WILLIAM V. MANY manufactures to order. IRON CASTINGS for Gearing Mills and Factories of every description.

ALSO—Steam Engines and Railroad Castings of every description.

The collection of Patterns for Machinery, is not equalled in the United States. 9-1y

ARCHIMEDES WORKS.

(100 North Moor street, N. Y.)

NEW-YORK, February 12th, 1836.

THE undersigned begs leave to inform the proprietors of Railroads that they are prepared to furnish all kinds of Machinery for Railroads, Locomotive Engines of any size, Car Wheels, such as are now in successful operation on the Camden and Amboy Railroad, none of which have failed—Castings of all kinds, Wheels, Axles, and Boxes, furnished at shortest notice.

H. R. DUNHAM & CO.

4-ytf

HUDSON AND DELAWARE RAILROAD.

NOTICE TO CONTRACTORS.

SEALED PROPOSALS will be received at the Office of the Hudson and Delaware Railroad Company, in the village of Newburgh, until the 10th day of October next, at 2 o'clock, P. M., for the Grading, Masonry, Bridging, &c., of their road from the west side of Chamber's Creek to Washingtonville, a distance of ten miles.

Plans, Profiles, Specifications, &c., will be in preparation, and exhibited ten days previous to the letting.
JAS. B. SARGENT, Engineer.
Newburgh, Aug 24, 1836. to 10-35

NOTICE TO CONTRACTORS.

PROPOSALS for excavating and embanking the Georgia Railroad from the upper end of the work, now under contract, to Greensboro', a distance of 34 miles, will be received at the Engineer's Office, at Crawfordsville, on the 21st and 22d days of October next.

—ALSO—

At the same time, for the Branch to Warrenton, 4 miles. And if prepared in season, the Branch to Athens, length 37 miles.

33-1220

J. EDGAR THOMSON,
Civil Engineer.

PATENT RAILROAD, SHIP AND BOAT SPIKES.

The Troy Iron and Nail Factory keeps constantly for sale a very extensive assortment of Wrought Spikes and Nails, from 3 to 10 inches, manufactured by the subscriber's Patent Machinery, which after five years successful operation, and now almost universal use in the United States, (as well as England, where the subscriber obtained a patent,) are found superior to any ever offered in market.

Railroad Companies may be supplied with Spikes having countersink heads suitable to the holes in iron rails, to any amount and on short notice. Almost all the Railroads now in progress in the United States are fastened with Spikes made at the above named factory—for which purpose they are found invaluable, as their adhesion is more than double any common spikes made by the hammer.

All orders directed to the Agent, Troy, N. Y., will be punctually attended to.

HENRY BURDEN, Agent.

Troy, N. Y., July, 1831.

Spikes are kept for sale, at factory prices, by I. & J. Townsend, Albany, and the principal Iron Merchants in Albany and Troy; J. I. Brower, 222 Water street, New-York; A. M. Jones, Philadelphia; T. Janviers, Baltimore; Degrand & Smith, Boston.

P. S.—Railroad Companies would do well to forward their orders as early as practicable, as the subscriber is desirous of extending the manufacturing so as to keep pace with the daily increasing demand for his Spikes. (1223am) H. BURDEN.

RAILWAY IRON, LOCOMOTIVES, &c.

THE subscribers offer the following articles for sale.

Railway Iron, flat bars, with countersunk holes and mitered joints,

	lbs.
350 tons 24 by 1, 15 ft in length, weighing 4 ¹ / ₁₀ per ft.	
280 " 2 " 1, " " " 3 ¹ / ₁₀ "	
70 " 11 " 1, " " " 2 ¹ / ₁₀ "	
80 " 11 " 1, " " " 1 ¹ / ₁₀ "	
90 " 1 " 1, " " " 1 "	

with Spikes and Splicing Plates adapted thereto. To be sold free of duty to State governments or incorporated companies.

Orders for Pennsylvania Boiler Iron executed.

Rail Road Car and Locomotive Engine Tires, wrought and turned or unturned, ready to be fitted on the wheels, viz 30, 33, 36, 42, 44, 54, and 60 inches diameter.

E. V. Patent Chain Cable Bolts for Railway Car axles, in lengths of 12 feet 6 inches, to 13 feet 21, 23, 34, 36, 38, and 39 inches diameter.

Chains for Inclined Planes, short and stay links, manufactured from the E. V. Cable Bolts, and proved at the greatest strain.

India Rubber Rope for Inclined Planes, made from New Zealand flax.

Also Patent Hemp Cordage for Inclined Planes, and Canal Towing Lines.

Patent Felt for placing between the iron chair and stone block of Edge Railways.

Every description of Railway Iron, as well as Locomotive Engines, imported at the shortest notice, by the agency of one of our partners, who resides in England for this purpose.

Mr. Solomon W. Roberts, a highly respectable American Engineer, resides in England for the purpose of inspecting all Locomotives, Machinery, Railway Iron &c. ordered through us

A. & G. RALSTON.

28-1f Philadelphia, No. 4, South Front st.

OFFICE PONCHARTRAIN, RAILROAD CO. }
New Orleans, 19th May, 1836.

THE Board of Directors of this Company, will pay the sum of five hundred dollars to the inventor or projector, of a machine or plan to prevent the escape of sparks from the Chimney of Locomotive Engines, burning wood, and which shall be finally adopted for use of the Company. No further charge to be made for the right of the Company to use the same.

By order of the Board,

JNO. B. LEEFE, Secretary.

28-3m.

THE NEWCASTLE MANUFACTURING COMPANY, incorporated by the State of Delaware, with a capital of 200,000 dollars, are prepared to execute in the first style and on liberal terms, at their extensive Finishing Shops and Foundries for Brass and Iron, situated in the town of Newcastle, Delaware, all orders for LOCOMOTIVE and other Steam Engines, and for CASTINGS of every description in Brass or Iron. RAILROAD WORK of all kinds finished in the best manner, and at the shortest notice.

Orders to be addressed to
Mr. EDWARD A. G. YOUNG,
Feb 20-ytf Superintendent, Newcastle, Del.

TO CANAL CONTRACTORS.

Office of the Sandy and Beaver Canal Co., }
July 25th, 1836.

Proposals will be received at the office of the Sandy and Beaver canal company, in New Lisbon, Columbiana county, Ohio, until Monday the 10th day of October next, for the construction of about 50 cutstone locks, 17 dams, (varying from 5 to 20 feet in height) one aqueduct across the Tuscarawas River, several bridges, and about 10 or 15 miles of canal.

Plans and specifications of the work may be examined at the Engineers office, New Lisbon.

Persons unknown to the Engineer must accompany their proposals with good recommendations.

B. HANNA, President.
E. H. GILL, Chief Engineer. 30-to 10

NEW ARRANGEMENT.

ROPES FOR INCLINED PLANES OF RAILROADS.
WE the subscribers having formed a co-partnership under the style and firm of Durfee, Coleman & Co., for the manufacturing and selling of Ropes for inclined planes of railroads, and for other uses, offer to supply ropes for inclined planes, of any length required without splice, at short notice, the manufacturing of rope, heretofore carried on by S. S. Durfee & Co., will be done by the new firm. All orders will be promptly attended to, and ropes will be shipped to any port in the United States.

8th month, 8th, 1836. Hudson, Columbia County, State of New-York.

E. S. TOWNSEND, GEORGE COLEMAN,
ROBT. C. FOLGER, SYDNEY S. DURFEE
33-1f.